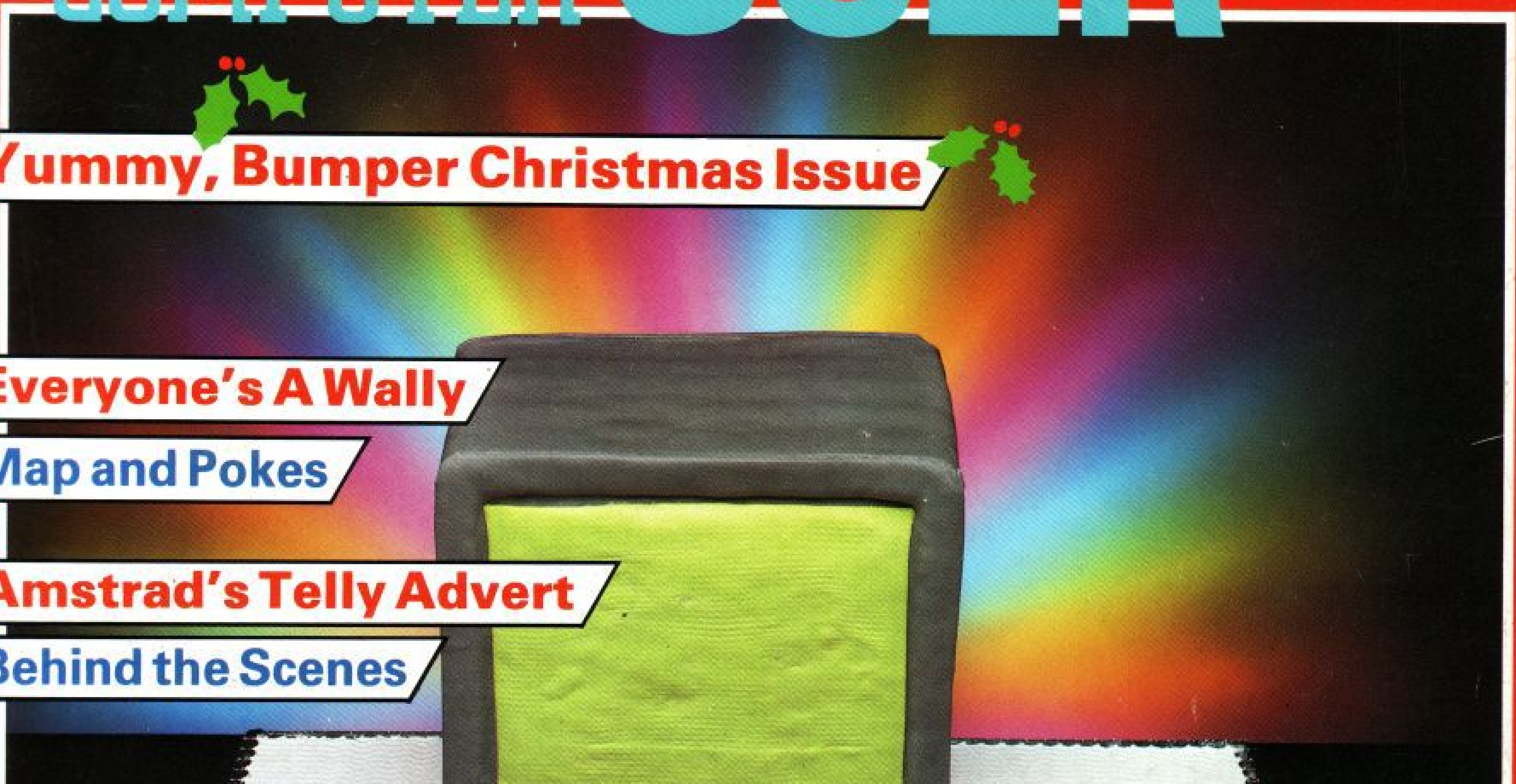
AMSTRAD COMPUTER USER

95p

December 1985



Yummy, Bumper Christmas Issue

Everyone's A Wally

Map and Pokes

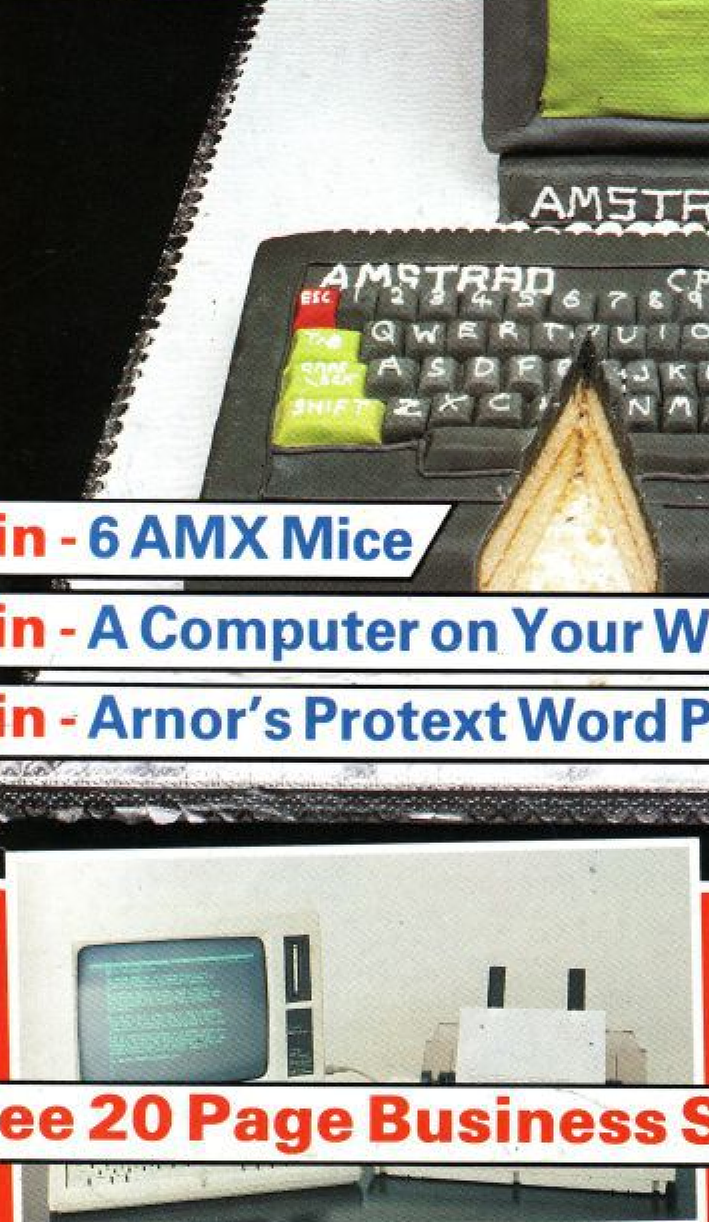
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Win - A Computer on Your Wrist

Win - Arnor's Protext Word Processor





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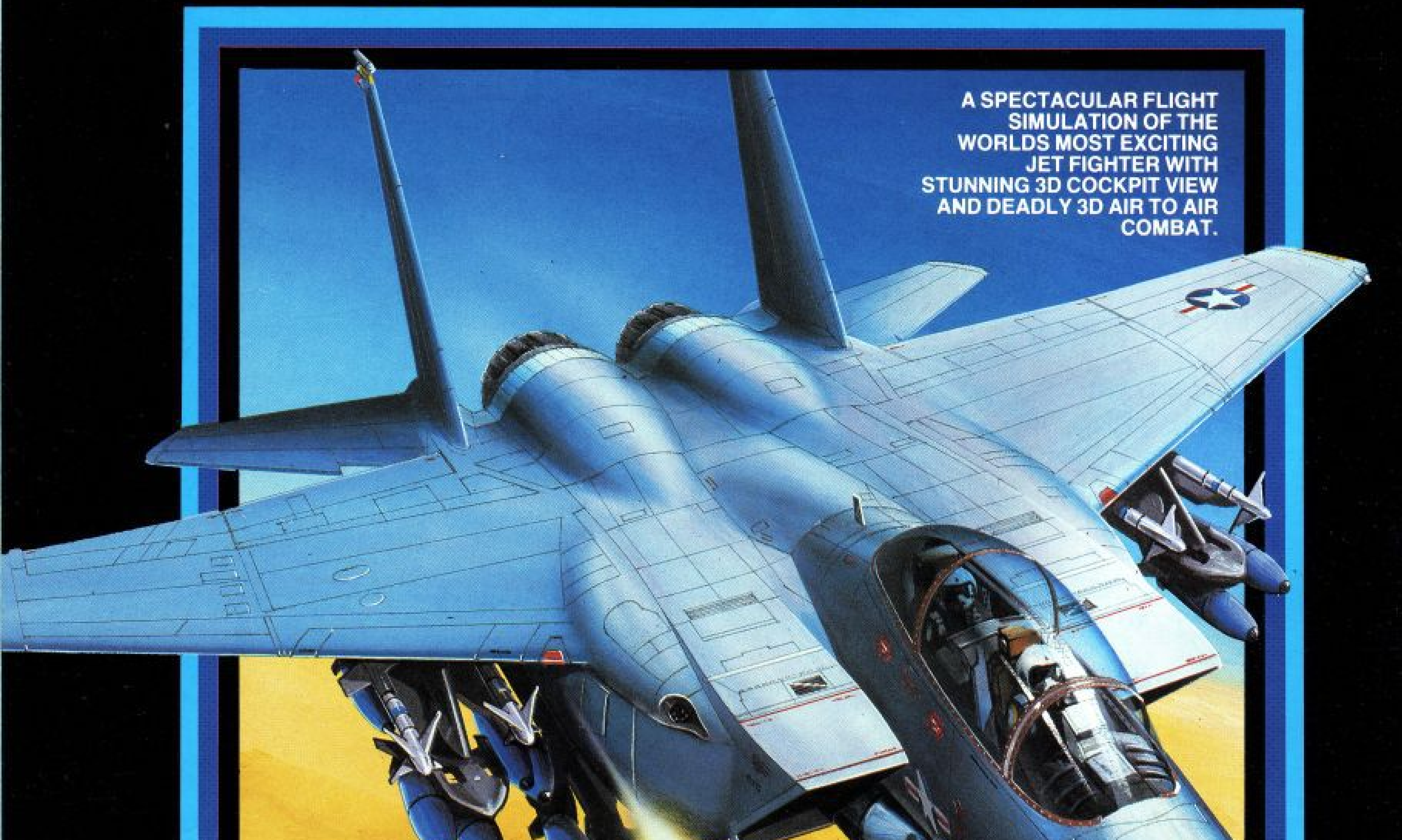
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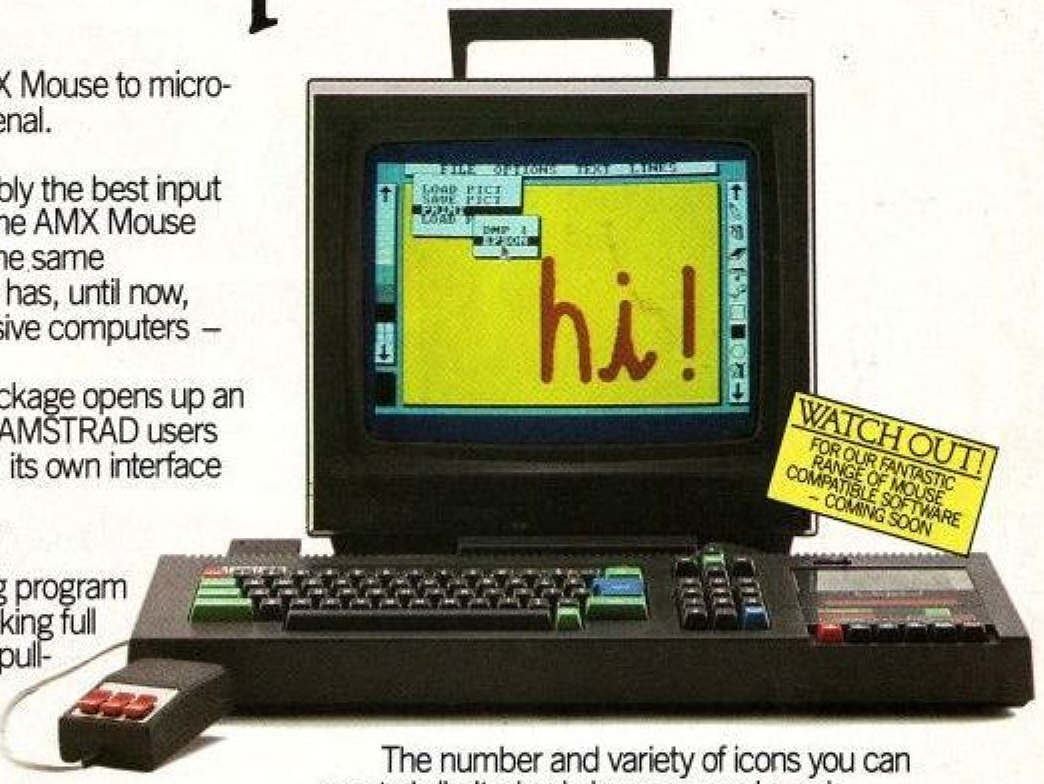
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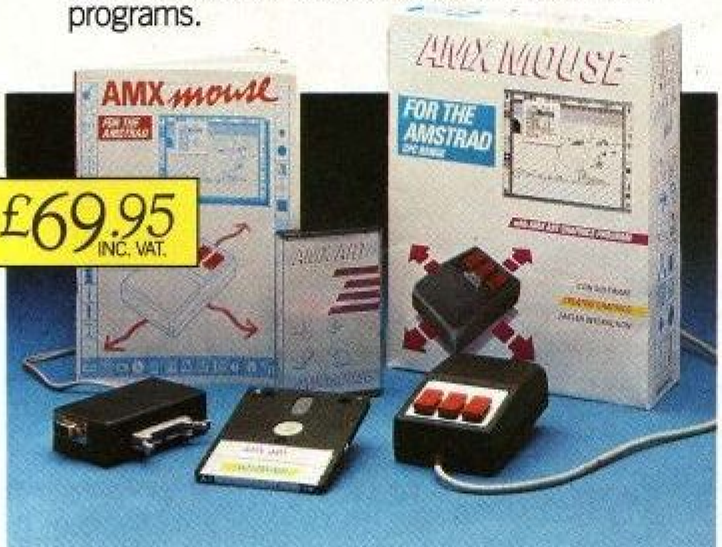
The software is supplied on cassette, and 3" Disc. The AMX Mouse Package is compatible with Amstrad CPC 464, CPC 664 and CPC 6128.

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AMSTRAD COMPUTER USER

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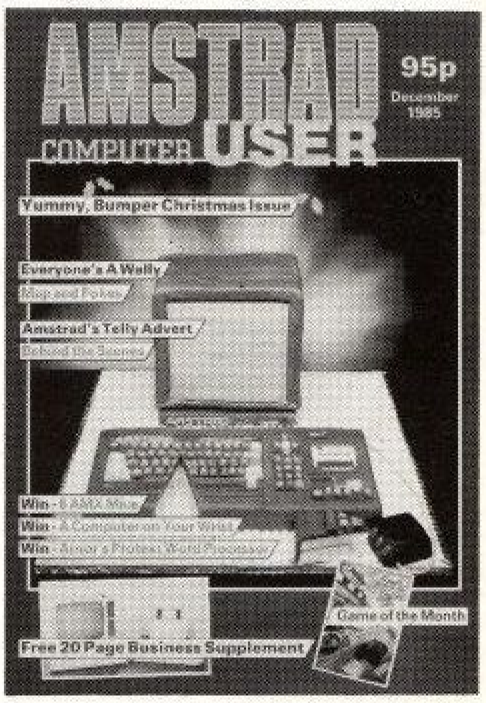
Reviews

Competitions

Programs

Amstrad Business Computing

Amstrad User is the OFFICIAL magazine for users of the Amstrad CPC 464/664 and CPC6128. It is published monthly. Back issues are available from Amsoft Mail Order at £1.20 each (including postage). Issues 1 and 2 are sold out. Overseas readers should contact Garwood Wholesale (0277) 823747



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User News...

Showtime



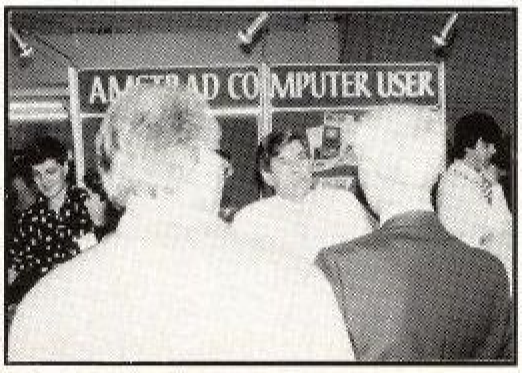
Despite the initial hiccoughs the Amstrad Computer show went ahead at the Novotel. Everyone was surprised at how well attended the show was, everyone except those visitors who had to wait an hour and a half to get in. The organisers promise that next time the crowds will be catered for.

The big news of the show was the launch of the DK Tronics RAM expansion system. There are two add-ons, a bank switched RAM pack and a RAM disc.

The bank switched RAM comes in two sizes, 64K and 256K. As with the CPC6128 the add-on does not allow the user to write huge basic programs but it does allow you to store information in the extra RAM, leaving more room in the main RAM for programs. The extra memory is not affected when the user presses CTRL, SHIFT and ENTER to reset the computer. This means that useful machine code routines can be kept, tucked away in the RAM and called into use even if the main program keeps crashing. High speed animation is possible by storing lots of frames in the RAM and downloading them rapidly. The expansion comes complete with bank switching software and requires no extras for you to start using it. The 64K unit costs £49.95, the 256K one only £99.95. DK Tronics RAM expansion works with the silicon disc. To use the disc you need to have a first drive and use the silicon disc as a second (or third) drive. The silicon disc contains 256K or RAM, so it wouldn't be that much use on a tape based system anyway. Even a fast tape would take ages to load a 256K file. The real advantage of a RAM disc is that it is fast. Anyone who has use the RAM disc on the PCW 8256 will know how useful a memory disc can be. The DK 'Tronics device is designed for use with the 464 and is electrically compatible with the 664 and 6128. However, new cases are being made so that the unit will fit snugly on the back. This will cause a slight delay in availability. The special software needed to use the drive is contained in a ROM. This makes the price of £99.95 seem very low.

Other products on show from DK 'Tronics included the speech synthesiser and lightpen, which have been reviewed in earlier issues, and a ROM for lightpen users. A speech ROM is planned.

The Amstrad User stand was very busy. For many visitors it was the first chance to see the new DMP-2000 printer, we went



through a whole box of paper demonstrating it, and the new Joyce (PCW 8256) wordprocessor was shown running both Locoscript and Compact accounting software. Some of the computers were running the new Amsoft Gold range of software, some the Amsgraph program listed last month and another was shown with the Okimate 20 colour printer.

Advanced Memory systems demonstrated the AMX mouse, Alligata did a roaring trade with the new doppleganger game and a compilation disc with several of their games for £12.95. Arnor ran a special show price on the Maxam Assembler and demonstrated the Protext Wordprocessor.

Cirkit demonstrated (but were not selling) their bargain basement modem and interface. Jolly good it looked too, the system looks like a very good way to get into the world of communications without it costing a fortune.

Dart Electronics sold every lightpen they took to the show. They may have the most expensive lightpen available for the CPC464 but it is the best around. Many vistors used the show as an opportunity to try out the various lightpens before deciding which one to buy.

Garwood Wholesale and Hisoft proved that there is already a good base of CP/M software for the CPC 6128 and Joyce, they were both demonstrating and selling a variety of programs.

Incentive software announced 'Moon Cresta' for the CPC, KDS had an upgrade ROM for the 104 modem available, Micro Power showed an early version of Dr. Who. Screens Micros had a very interesting board labelled '512K Ram expansion', but they didn't have any information on it. The Screens device has to be fitted inside the case of the 464 so it will invalidate the warranty. A forthcomming add-on from Screens is an MS-DOS card.

Viewfax demonstrated the new Amsnet service. Amstrad User will be providing articles and programs for Amsnet. You will be able to download the software with either the Skywave interface or by using the (very much better- Ed) interface from Honeysoft. Honeysoft will be offering a telesoftware downloader which can be used in conjunction with the Amstrad RS232 interface. Next to the Amstrad User stand Vortex were demonstrating their next release -Tornado Low Level, along with Highway Encounter (review page 72), Android One and Android Two.

In total 9,832 people attended the show. There will be a chance to do the whole thing again on January 11th & 12th.

Record Profits For Amstrad



Amstrads Chairman Alan Sugar

Amstrad have proved that they are the most sucessful home computer manufacturer around. They announced annual profits of £20.1 Million. This is a 122% increase on 1984. Turnover went up from £85m to £136m with a lot of the profits being attributed to computer sales. For the first time the export market has really started to have an effect. With the CPC6128 and PCW 8256 just launched, Amstrad can expect another profitable year ahead.

Confuzed?

If you were one of the winners of the confusion competition in the July and haven't got your sweatshirt yet then please let us know and we will make sure it arrives. There are five more sweatshirts up for grabs for the first people to tell us what happens when you finish the 64th sheet in Confuzion.

Competition Busters

Here are the names of the winners of our September 'Ghostbusters' competition. To jog your memories a bit, each winner will receive a copy of the best-selling game by Activision. So here are the lucky winners: S Harrison of Cambridge, D Bernstein of Sunderland, D Matharu of London, D Marriott of Kettering, T Thomas of Brierley Hill, Antony Pipes of Findern, D Dee of Cardiff, N Morris of Dunstable, F Akinlawon of London, J Cartwright of Canvey Island, J Stephenson of Rastrick Brighouse, L Waterson of Maldon, A Preele of Worcester, P Hall-Palmer of Bradford on Tone, J Judd of Croydon, C Beecham of Kidlington, J Potter of Telford, S Jones of Newport, T Atkin of Gainsborough, D Allan of Hurtnell, G Tate of South Shields, M Saunders of Penlan, B Newell of Grays, M Perry of Newcastle-under-Lyme, H Hall of Carlisle, R Carter of Boston, L Walker of Liverpool, D Cunningham of Livingston, W Treves of London, R Oakes of Wimbourne, J Barlow of Wigan, R Honeywill of Swindon, P Bailey of Winkleigh, L Napier of Edinburgh, J Saville of Leeds, S Whitehead of Cotton End, N Griggs of Hove, N Chaplin of Maidenhead, J Starmer of Sutton Coldfield, P Kitching of Grimsby, D Hardy of Norwich, D Smith of Amersham, H Westley of Kenilworth, A Daw of Pontefract, M Savage of Northampton, R Berridge of Bingham, J Bolton of Plymouth, C Renton of Inverness, K Hunt of Stockport, S Wilcox of Canterbury, J Elliott of Thongsbridge, J Hodge of Market Drayton, M Burdass of Broughton, M Halpin of Bridgewater, R Turner of Newport, J Holmes of Skelmersdale, D Coles of New Malden, B Smith of Nettleham, G Tourle of Heathfield, D Wakelam of Ellesmere Port, D Stanton of Fleet, J Bell of Hayle, D Cummings of Edinburgh, J Hilton of Bolton, M McHugh of Eastbourne, D Gough of Bristol, A McCarthy of Sidcup, E McArdle of Ayr, P Kelly of Preston, G Burgess of Gosport, I Williams of Formby, G Smith of Macclesfield, C Hawes of Bolton, J Cardy of Bedford, P Besant of Kalgoorlie, Western Australia, P Wothers of Rushden, P Stagg of Ricksmansworth, S Pate of Bridge of Earn, J Bower of Cockermouth, S Russell of Glasgow, L Thorne of March, P Browne of Bromley, J and A Hudson of Sidcup, P Greener of Blyth, C Everett of Shepshed, R Lona of Huntingdon, P Smith of Amesbury, H Lang of Taunton, L Smith of Pickering, M Housby of RAF Gutersloh, N Goddard of Eccles, S O'Sullivan of Halstead, A Diebelius of Albany Mewport, J Forbes of Stevenston, A Jackson of Worcester, M Elliott of Tenterden, C Martin of Plymouth, D Akien of Watford, W Freelanel of Dalkeith.

Big Barry Beats Bytes

Boxing is big business, now the home computer industry is joining in. Amsoft have launched 3D Boxing and Activision are to launch the 'Barry McGuigan World Championship Boxing' which includes training and 19 different opponents. Amsoft's 3D Boxing has you running around the ring. With all this boxing going on your keyboard could get seriously bruised.

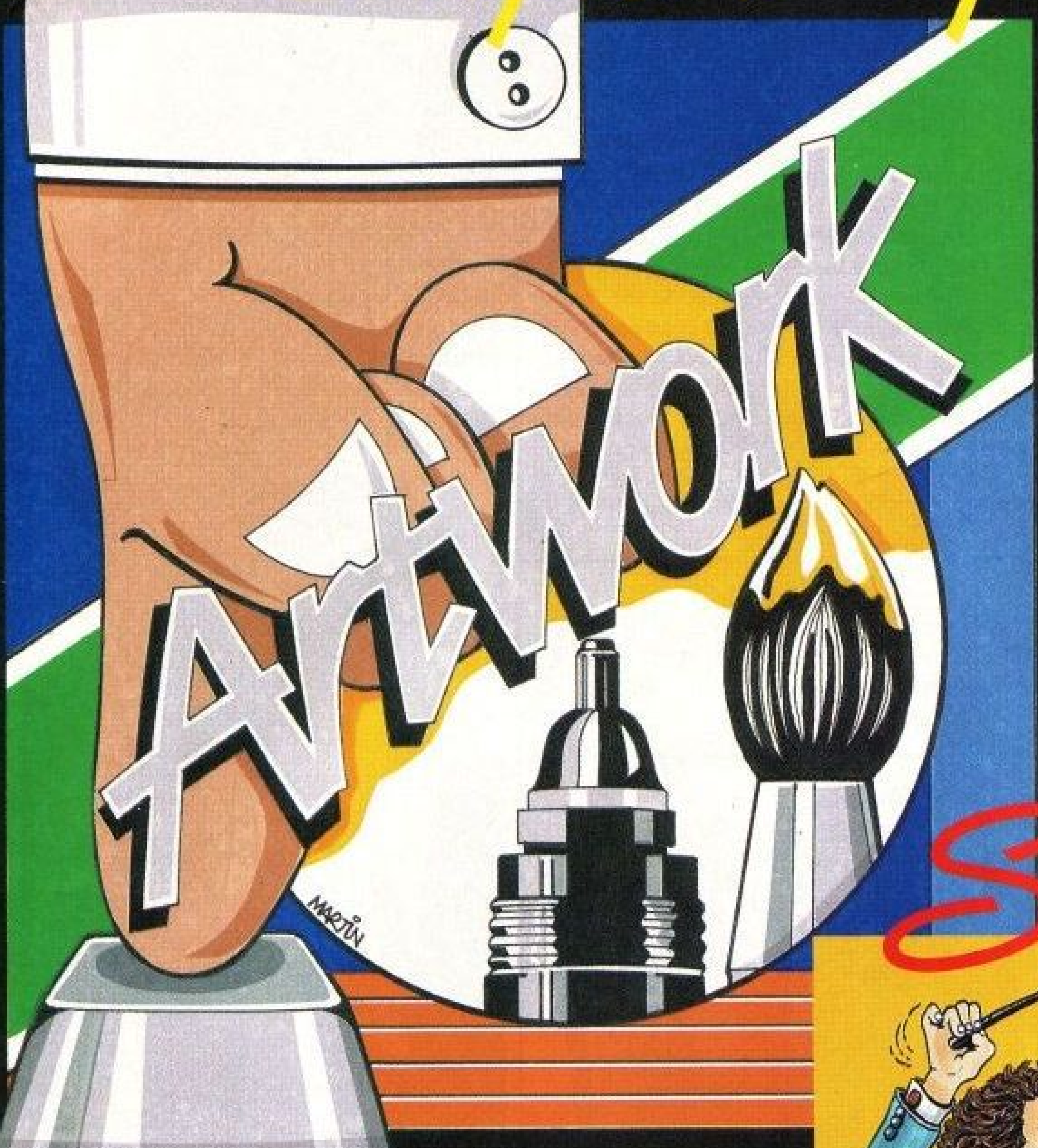


Activision's MD Hugh Rees-Parnall (left) with Featherweight champ Barry McGuigian.

More Soft From HiSoft

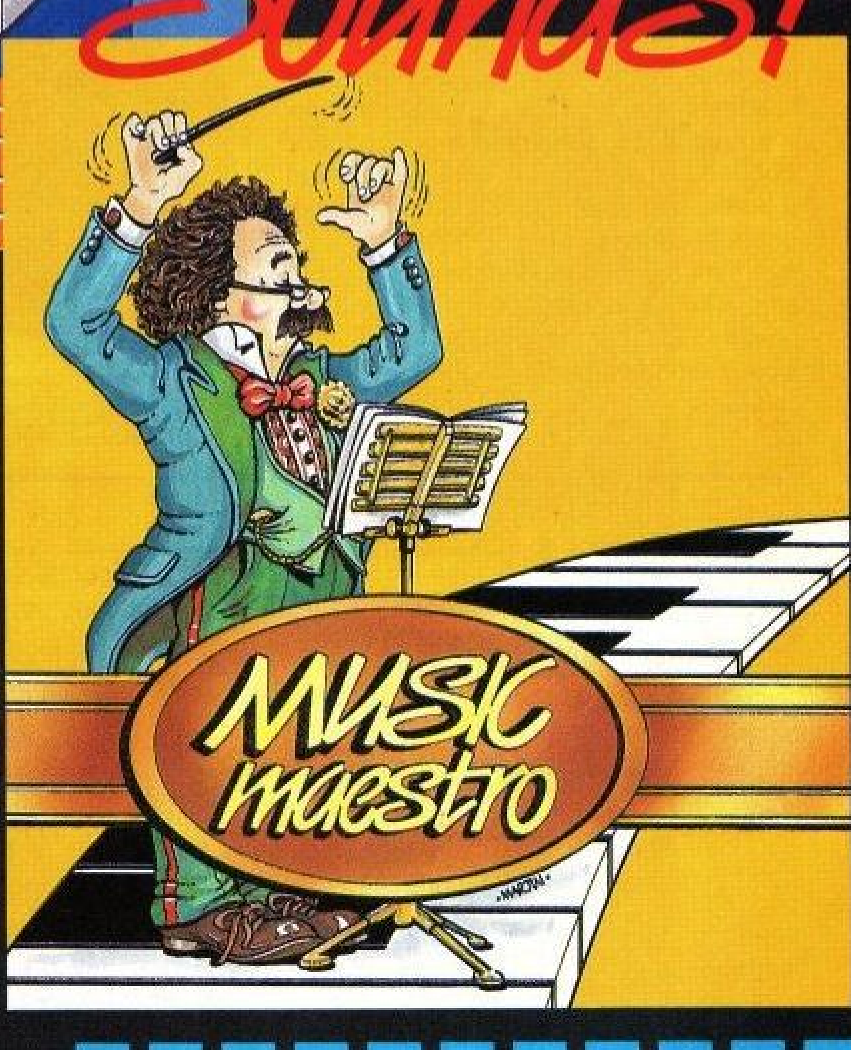
HiSoft are to produce 'Expert Systems' for Amstrad computers. An expert system is a computer program which can 'learn' facts from an expert and then use that information to teach others how to solve their problems. The first systems will already have specific information in them, later HiSoft will produce a system builder but for now only one product is available, called 'Your Health' and subtitled 'The Organically-Grown Wholefood Expert System' (That's a bit of a mouthful - Ed), HiSoft claim that it is the best thing since sliced (brown) bread. The program advises you on how to look after your body. 'Your Health' costs £8.95 or £13.95 on disc.

Superb Graphics!



ARTWORK – A superb graphics program designed to allow even the most inexperienced user to create graphic displays. Draw pictures using sophisticated circle, ellipse and box drawing facilities with full use of all available screen modes and colours. Special features include Fast Colour Fill, complete Screen Scroll (all directions), 'Help' option and the ability to save or load completed pictures to tape or disc. Whether you have a serious interest in art or simply enjoy doodling, this easy-to-use program is guaranteed to provide hours of enjoyment.

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Book Winners

Another competition we ran in the September issue of ACU was the Pitmans competition to give away 30 copies of 'The Amstrad Games Book'. This was a quick quiz testing your knowledge of some of the best-selling games around but, I'm afraid, you don't know your games very well; all except, that is, for the following lucky winners: D Quincy of Otley, V Farrance of London, Chris Hurst of Wokingham, J Bell of Hayle, A Kerr of Plymouth, D Wigley of Duffield, D Cunningham of Livingston, J Grierson of Dingwall, N Allen of Bridgnorth, D Rostron of Stanley, J Cater of London, F Deal of Chichester, C Baldwins of Canterbury, S Oddy of Westbury, D Flint of Mapperley, M Wilkes Stourbridge, M Herron of Luton, Andrew Webb of Devizes, D Mullins of Taunton, K Macaskill of Alloa, D Harris of Hornchurch, S Garner of Basildon, M Burdass of Brigg, R Evans of Bridgend, J McCann of Bramaton, A Critchley of Bracknell, N Griggs of Hove, W Freeland of Dalkeith, D Smith of Amersham.

Sagesoft Launch Amstrad Range

Sagesoft are launching completely new versions of their CP/M based Accounts and Payroll software packages to run on the CPC6128 and the PCW 8256 (Joyce). The Sage 'Popular' range is aimed at the small business and will cope with both cash and credit trading. For £99.99 you get a system to cope with fully automatic sales, and both nominal and purchase ledgers. The Payroll system costs £69.99. A special offer of both programs for £149.99 is available. For more details contact Sagesoft on 091-284-7077

Who Goes There

Having made a name for themselves as suppliers of quality utility software Micro Power are intent on leaving a mark in the games market. Their first venture is 'Dr Who and the Mines of Terror'. The plot revolves around trying to stop an evil force from building a machine which is capable of editing and replaying time. The program is beautifully packaged with maps, code books and a help envelope. It will be available from early November and cost £14.95 or £18.95 on disc.



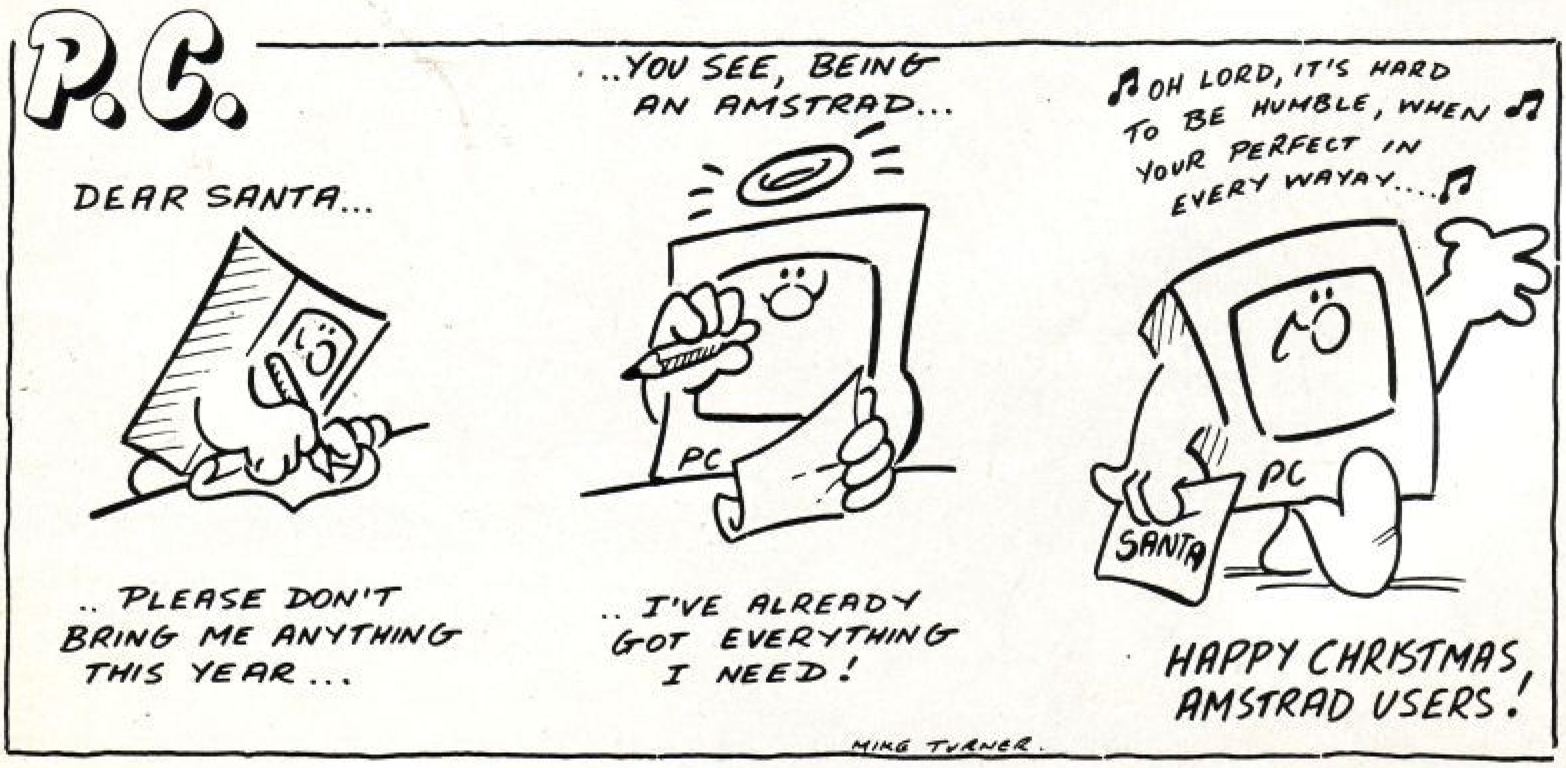
The Doctor couldn't make it so here is Micro Power's Bob Simpson with a bit of paper.

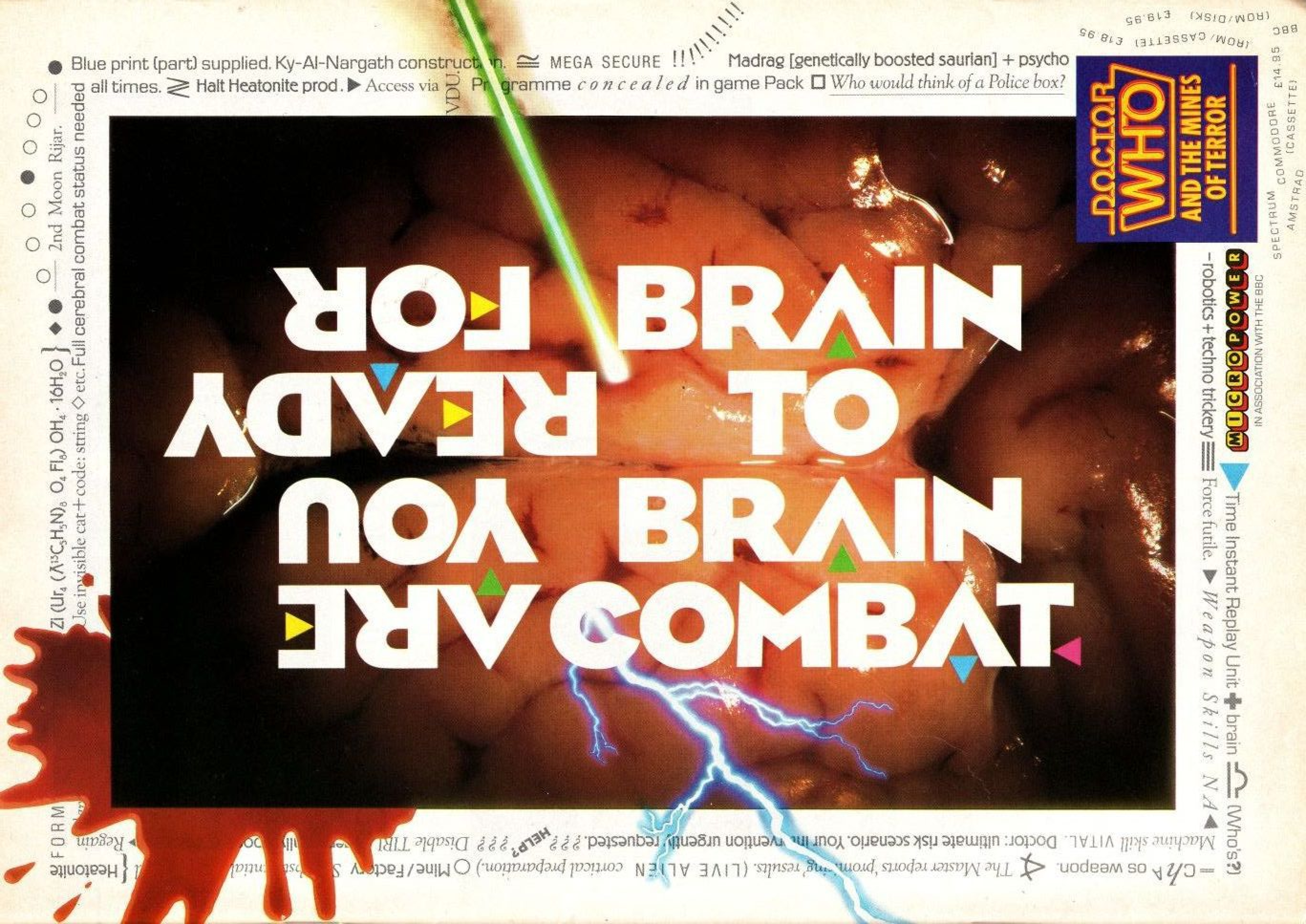
Help! It's the Wulf!

Sabre Wulf to be precise. The latest release from 'Ultimate Play the Game' harks back to the days before Ultimate wrote 464 programs. Originally produced for the Spectrum, the game does not feature the stunning 3D graphics used in Knight Lore and Alien 8 but does have the bonuses that it is very much faster and allows you to kill things with your sword. The game is a 2D maze, you have to find the four sections of an amulet which can then be used to kill the final baddie. There are lots of little touches, like encharted orchids and a selection of treasures.



ACU

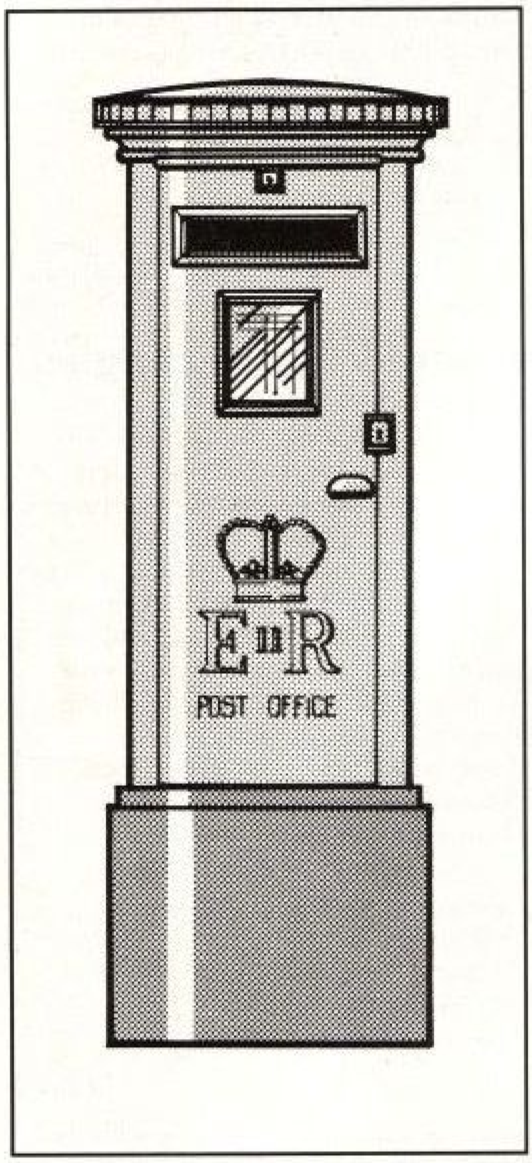




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Please bear in mind that the views expressed herein are not necessarily those of Amstrad or Amsoft. Be assured that all your views are given thorough consideration. This letters section is the Amstrad Computer User's own forum.

Write to reply



Joining the CP/M User Group

Could I please use your magazine to clarify the status of the CP/M User Group (UK), as one or two Amstrad computer users have got themselves rather confused in their dealings with us.

The CP/M User Group (UK) is a private club. (It is nothing to do with Amstrad User - Ed.) We welcome and encourage all CP/M users to join. Although members get a great number of benefits from joining, and we have remarkably few members who fail to renew their membership, we always hope that members will contribute as much as they obtain. All the services of the group are manned voluntarily by unpaid members. The subscriptions merely cover the cost of publications, postage, and administration. We are a charity, not a profit making organisation.

The User Group enjoys particularly good relations with Amstrad, but there is no connection beyond the fact that Amstrad, like many other computer manufacturers, are corporate members. The group is entirely independent and tries to cater to all CP/M and MSDOS users. There are special-interest groups that deal with the Amstrad kit specifically.

We like distributing free software; we like producing the journals and newsletters, and we like manning the 'help' line. We also think we provide an efficient service that a commercial concern would not be ashamed of; for example: orders for software volumes are generally turned round within 24 hours. The User Group's work extends far wider than these more obvious services to our members. We have, for the past five years, attempted to represent the interests of the CP/M user in an industry that is in a continual state of flux. This work is generally unspectacular, and is done through investigating members' problems, making contacts within the industry and the computer press, and generally trying to get a better deal for the 'consumer'.

We are glad to say that a great number of Amstrad CP/M users have recently joined the group. We are encouraging owners of the cheaper CP/M machines such as Arnold, the BBC, Commodore, Tatung and so on to join, as we feel that they will make the Group livelier, and will contribute greatly to our activities. We have generally been struck by the friendliness, and appreciativeness of these new members and we are therefore certain that the current revival in the use of CP/M will lead to new vigour in the group's activities without compromising the professional and technical aspects of the Group's activities.

Application forms for membership are available from Diana Fordred, our membership secretary, at:

72 Mill Road
Hawley
Dartford
Kent
DA2 7RZ

Andrew Clarke
Publications Editor
CP/M User Group (UK)

Longer legs

I have just finished typing the listing for 'Crazy Legs' from your September issue. I have not had 'Arnold' for very long and as yet have not got round to joining the User Club, but I will - it's a promise.

Anyway, this program has helped a great deal in getting to know my new computer. My sincere thanks to Craig Mitchell for his sound and graphic routines.

May I (or dare I) suggest some small mods to the program:

```
Line 370 insert F1=0 after SC=SC-SO
```

Having first stepped on the 'Teleport' each disc after uses the Teleport sound, also the score does not increase if below SO.

```
Line 2420 change (for f=1 to 10)
to (for f=1 to 15)
```

This clears all the random coloured horizontal lines from the screen.

```
Line 2410, add to this line MEN=MENU+1 :
LOCATE 2,22: ?"EXTRA MAN AWARDED"
```

I thought it would be nice as a bonus to the bonus to have one more man.

Line 2330, to make those multi-coloured lines move further up the screen to cover all possible bonus awards, change:

```
for g=1 to 150   to for g=1 to 250
sound...g/6      to sound...g/10
```

D A Whitaker
Leeds 10.

Amazing

Great listing by Mr Sharp (3D Maze), trouble is all his INKS are wrong! Try changing line 2130 to the following:

```
INK 0,0:INK 1,1:INK 2,26:INK 3,6
```

What a difference! Much more contrast.

D Messenger
Kettering

Micro Power Strike Back

In his review of our SuperPower ROM board and ROMS, Cliff Lawson makes some errors of fact and one or two statements of opinion with which I cannot agree.

All our ROMs work on the 464, 664 and 6128, with the sole exception of the Programmer's Toolbox. The main reason for the Toolbox's existence is to add the extra commands of Basic V1.1 to the 464, and in order to achieve this it is necessary to do things in a way that is incompatible with V1.1. Nevertheless, we do hope to put those parts of the Toolbox not available in V1.1, together with some new utilities, into a version for the 664/6128.

The board is electronically compatible with both the 664 and 6128. There is a 'physical' problem due to the redesign of the cases of these models, but we have been able

to help a number of 664/6128 users wanting the board. Those with another 'add-on' e.g. the Amstrad RS232 interface, can just plug our board in at the back, though, because of the addressing problem referred to, any ROMs on other hardware will need to be selected explicitly on our board, This is simply a matter of plugging in one link. The new SuperPower ROM board, which fits all three CPC computers, and does not suffer from the above problem, should be available around the end of November. Both boards work with all the ROMs and add-ons that we have seen, including all Arnor ROMs.

Cliff also suggests that ROM software and the board is rather expensive at £39.95. However, if you put seven ROMs on the board the average cost is only around £45. Those who do not think that they will want that many ROMs might well consider the hundred or so available for the BBC micro, for which the cost of quality ROMs is about £50" and the advantages of ROM software (instant loading, extra RAM available for data, no chance of corrupting the program) compared with the vast majority of CP/M software e.g. the Micro Script group at £50 each.

Cliff may well be right about the initial impact of the Toolbox being greater than that of the Disc Utility for the lorry driver and his wife, but for the many experienced users who have upgraded to an Amstrad computer, I believe that the Disc Utility will be invaluable.

One final point: the current board has seven ROM slots, the new one will have eight.

Dave Parsons
SuperPower Project Manager

ACU: A blank Eprom costs around £5. We still think that £40 is a high price for 16K of utility software - however good it is.

LOGO BUG?

The example of the FILL command for the 6128 (Dr. Logo Chapter 6 page 23) does not work. In fact it seems that the command has not been implemented as it is not listed in the symbol space by the '.CONTENTS' command. Secondly, it is possible to confuse the Logo by switching between 'text screen' and 'full screen' modes and issuing the 'ST' and 'HT' commands, such that 'ST' hides the turtle and 'HT' shows the turtle.

J R Wozniak
Trowbridge

ACU: We had to torture the Amsoft programmer responsible for the 6128 Logo for several hours before he was willing to admit that these problems existed. The FILL command as you have noticed is just not recognised by the Logo command processor.

The reason for this is that it was removed at the very last minute (after the manual had been printed) because it just did not work. The reason was that the DOTC command used by the FILL falls into co-ordinate rounding problems, but this was only discovered after the software had been shipped when it was too late to correct it.

Because the whole Logo system had been recompiled, all traces of the FILL command were removed so that it would now be impossible to modify the current version to reinstate it and the Logo cannot be re-compiled to make a new version as Amstrad no longer have the necessary files. If the word had never appeared in the manual then it would never have been missed (people with 2.2 versions never missed it), so this problem could probably be described as a documentation error.

The second fault is caused by the Digital Research specific part of the Logo calling the routine to draw the turtle one too many times and, because it is exclusive ORd, it appears when it shouldn't be there and it disappears when it should be visible. Using 'CS' rather than 'SS' to change from text mode to splitscreen mode will circumvent the problem.

Frozen CPC

The quality and the technical excellence of the Amstrad allows this computer to adapt itself readily to the engineering sector.

I would like to communicate with other Amstrad users who have an engineering background and are using the Amstrad to assist in engineering problems.

Air conditioning, refrigeration and mechanical ventilation are the areas of principle interest.

Also, could any readers assist by developing a modification to Mastercalc to allow the spreadsheet program to calculate with positive and negative powers and roots.

Graeme Williamson
26 Mackezlar Drive
Browns PlainsBrisbane
Australia
4118

Bugs in Basic

I would like to point out a few errors I have found in Locomotive Basic V1.0; errors which I haven't seen mentioned before.

```
10 CONT
run
Cannot CONTinue in 10
Ready
cont
```

Sometimes I get a complete reset, sometimes it just stops and refuses all further input! It could be argued that this is not a real error, since a program like this doesn't make any sense. However, try:

```
10 DEF FN fak(n)=n*FN fak(n-1)
20 PRINT FN fak(5)
run
Memory full in 20
Ready
```

So far, so good. This should result in overflow of the expression-stack. But try pushing ESC and the screen goes crazy!

```
10 DEF FN fak(n)=(n>1)*FN fak(n-1)
20 PRINT FN fak(5)
RUN
Oops! A software reset!
```

J Andersen
Denmark

Amstrad Users Singled Out

We are a group of Amstrad users in Singapore who are interested in getting in touch with 464/664 users in England.

As we are a newly formed group, any information would be greatly appreciated. Those of you, who wish to find out more about Singapore are also welcome to write.

As Singapore is so far from England, please write to our contact in London.

Please include you name and address. All letters will receive a reply.

Please send your letters to:

Singapore Amstrad User Group
c/o Patrick Goh
1 Manor Court
152 Abbey Road
London NW6

E Goh
Republic of Singapore

Poor Cows

Your feature article in your November issue is headed 'What is AI?'.

I can tell you.

For many years, within the farming community, 'AI' has been short for 'Artificial Insemination', which produces consistently good calves, but is not much fun for the bull and even less for the cows.

If I tell my secretary that we are going to adopt AI in the office, I strongly suspect that she will leave.

Jeffrey English
Brockenhurst

Is the 1.1 Rom an Upgrade?

As a regular reader of your magazine. I would like to offer some observations on the Amstrad computers in the hope that they may reach the ears of Amstrad and Amsoft. I have a CPC464 with DD1 and a CPC664 and it is fortunate for me that I have some understanding of Z80 Assembler because

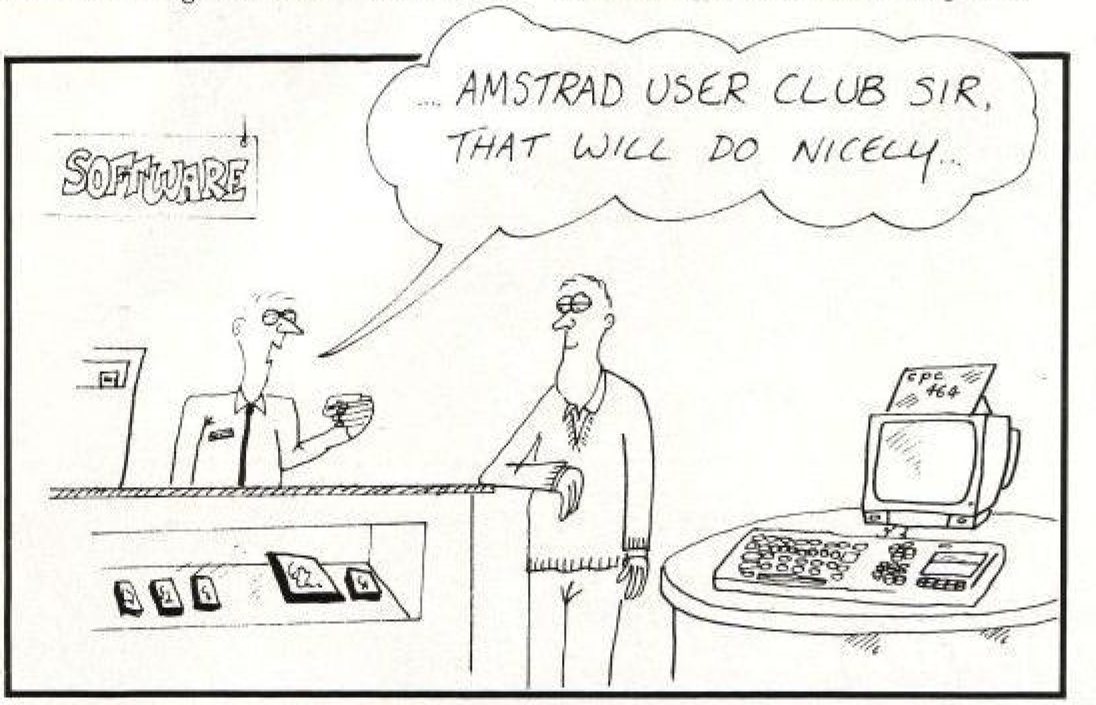
otherwise I would have precious little software to run on the disc drives.

Amstrad appear to place a great deal of faith in the future of disc drives as the storage medium of the future, with good reason, but it will not happen unless the software becomes readily available, and at the right price. What are needed are disc albums containing eight or so games each, making proper use of the disc capacities. Amstrad, of all companies, should know that you cannot sell the hardware without suitable software support.

Putting the 1.1 ROM in the 664 was a mistake, but putting it in the new 6128 is ludicrous. Whilst it is not Amstrad's fault that some software houses have failed to abide by the jumpblock convention, Amstrad should have been aware before releasing the 664 that this was so. Given the choice of issuing a machine that was 100% compatible with the 464"DD1 or one that contained some minor refinements they should have chosen the former.

The machines are so similar that they should contain the same ROM, and be fully software compatible. Indeed, I would suggest that if Amstrad offered a 'downgrading' service to fit the 1.0 ROM to the 664's, they might be surprised at the response.

However, the same logic does not apply to the 6128. Whilst it should initially benefit from the existing range of software (when it is available on disc), the additional 64k of memory could represent a major enhancement. Having found some space in the 1.0 ROM, the first routines put in there for the 6128 should be those needed to make full use of the additional memory. If there is still space left then by all means add other refinements, but these are minor points.



Putting the 1.1 ROM in the 6128 neither makes it 100% compatible with the 464 nor meets its own needs. When I first saw the 6128 I very nearly bought it, but when I realised that the bank switching routines were provided as RSX's on disc, I decided otherwise.

Apart from business use under CP/M +, Amstrad appear to regard the extra 64k as little more than a sales gimmick, and this is a pity. Even as it stands, the 6128 represents exceptional value for money and deserves to sell well, but it is not what it could have been. Let's hope that we soon see a Mk.2 version with the right enhancements built in, I would buy that.

A T C Longhurst
Peterborough

Daley Goes 664

I would like to inform you that Ocean's 'Daley Thompson's Decathlon' is now compatible with the CPC 664 and runs perfectly normally with no problems. You see, I used to have a CPC 464 and I bought 'Daley's Thompson's Decathlon' for it, then I changed my computer to a CPC 664 (yes, another sucker, but proud of my computer) and I found out that it wouldn't load on it, so I phoned Ocean and they told me if I send back the original copy they would replace it with a copy that worked with the 664. I waited a few weeks and they sent me a new copy that worked with my 664. They also told me that any future Ocean or Imagine release for the Amstrad Computer will be compatible with the 664 (maybe also the CPC 6128). So I recommend anybody with the same problem to do what I did.

Mark Anglin
London

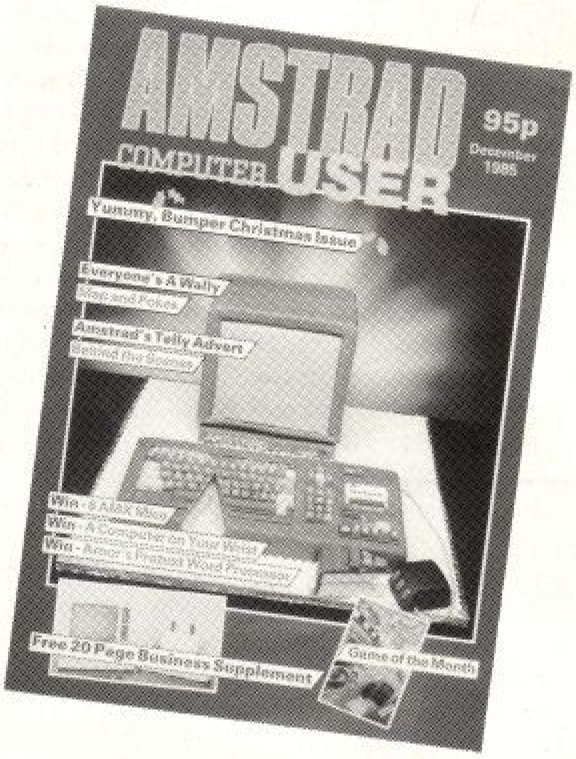
ACU

Having your Cake and Eating It

Happy birthday to us, happy birthday to us, happy birthday Amstrad Computer User, happy birthday to us.

Amstrad User is 1 year old, to celebrate we made a cake. You will have seen it on the front cover, unless you are one of those people who starts at the back of a magazine. The cake was actually made for us by Raven's of Ingatestone. The final AMX mouse was not ready when we took the photograph so we had to make do with an earlier AMX design. Anyone winning the competition on page 97 will get a high quality Amstrad model. Despite spending two days under the photographers lights the CPC cake still tasted pretty good. Even the staff of Amstrad User couldn't tackle the the monitor so that went to a local hospital.

Christmas is about to descend, a bumper time for computer owners. Not only will there be a lot of people buying shiny new Amstrad computers, there will be lots of new add-ons and software available. New games which have arrived at the Amstrad User office too late to be included in the reviews include 'Marsport', 'The Secret Diary of Adrian Mole' and 'The Soul of a Robot'. The computer shops' Christmas lists should be longer than ever this year. Whatever you are hoping for, from a PCW 8256 to a copy of 3D Grand Prix, Amstrad User will help you make the most of it. We already have some exciting things lined up for the next issue, including details of a new screen mode...Mode 3.



Simon Rockman

LIVE OUT YOUR DREAMS

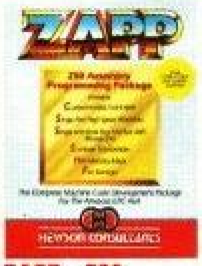






These programs are supplied on cassette and are compatible with the 664 and 6128 when used with cassette player and suitable leads.

Now we have just the ticket to stoke up your Amstrad as the best selling Southern Belle is now available for all Amstrad computers.
Hop abroad the footplate of the powerful King Arthur Class locomotive and journey back to the glorious days of steam during the 1930's.
You can almost feel the heat from the firebox and smell the billowing steam as you thunder along the famous London to Brighton run.
Using the footplate controls and gauges, you have 60 minutes to tow the Pullman carriages from Victoria to Brighton. Any delays could ruin your timetable, so keep an eye on your stocks of water and coal – check the efficiency of your coal burn by the density of the smoke. Your present speed, time and the position of the next signal for guidance are also displayed.
Wipe the soot from your eyes and peer out of the cab to pick out the 24 stations as they rush by. Look out for other well known landmarks such as Battersea Power Station and the Clayton Tunnel.
Take the option as the driver with your Spectrum guiding you along the right track, or harder levels where you are the driver *and* the fireman, perhaps facing adverse conditions that could make you disastrously late!
Realistic controls such as a regulator controlling the flow of steam to the cylinders, the damper controlling air flow to the fire, vaccum brakes and the fire doors, plus authentic sound and graphics make Southern Belle second only to the real experience.



ZAPP – Z80 Assembly Programming Package

Now you can develop professional quality machine code software on your Amstrad using this fast and versatile assembly language programming package.
Includes Editor Assembler, Monitor and Disassembler.

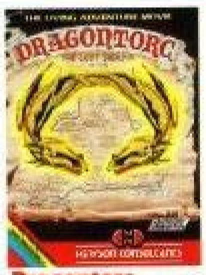
For all Amstrad computers. **£14.95**

GSH

HEWSON CONSULTANTS

56b Milton Trading Estate, Milton, Abingdon, Oxon, OX14 4RX.

For mail order send cheque/postal order made payable to Hewson Consultants. For credit card sales state your Access/ Barclaycard number and enclose a specimen signature.
Don't forget to include your own name and address.



Dragontorc
As Maroc the Mage, can you beat Morag the Shapeshifter to the lost crowns of Dumnovia and free Merlyn to save Saxon Britain from a century of darkness? 3D Sensory Animation across hundreds of locations add up to an adventure that could take a lifetime to complete!
For all Amstrad computers. **£7.95**
Also available for all 48K Spectrums **£7.95**

As part of our continuing development of innovative software we are always happy to evaluate software sent to us with a view to publication.

The Cricklewood Dream Factory

Ever wondered how a TV commercial was made? Well, in accordance with W.C.Field's famous advice, actors should never work with children, animals or computers ... William Poel looked in on the glitter and razzamatazz

Making a TV commercial is not a low cost event. The reasons are manyfold, but boil down to the fact that it takes about a day of filming to produce material to hang together a 40 second commercial. The credits list for that day of filming would do justice to War and Peace.

Many think that this all adds up to a gross waste of money: but when an advertiser is about to spend millions on air time, then it makes a lot of sense to ensure that the commercial is the most professional possible production. After all, in a 30 minute TV drama there's all the time in the world to tell the story and convey the message.

If your 40 seconds of advert fail to make the point, then there's a big problem. And the way in which the point is made is so important: it's no use producing an ad that everyone regards as witty and good fun if no one can remember the product being featured. That famous Joan Collins/Leonard Rossiter advert did wonders for all the Vermouth sales, not simply the Cinzano brand that was paying for it!

The Professionals

Armed with a combination of Amstrad's determination to feature the product, and the agency's determination to make an ad that is a memorable monument to their art, the director of the commercial, Ian McArthur, produced shots of every sequence from every conceivable angle. For the two commercials featured in the 6128 and software autumn campaign, there were some 35 different sequences shot. Working out at just over 2 seconds each if they all got used.

Editing the footage together to produce 40 seconds of crisp professionalism is the key to whole production task - and with so much material to work from, and most of it technically excellent - the task was not easy.

The Players

Greg Delany, of Delaney Fletcher Delaney (DFD in the parlance of the advertising trade), was the agency creative director present during the shooting. Lee Golding the young art director whose 'baby' this was, and who shows considerable promise in a notoriously fickle business.

Ian McArthur directed the shooting, assisted by a battery of gaffers, sparks, clapper loaders, lighting and camera men. On the hardware side, the ubiquitous Arriflex 35mm camera complete with fox wedge, Bazooka, Worral, Pancakes and Roll Bar Adjuster - to name but a few.

The lighting check list is similarly an unlikely collection of blondes, pups, mizoras, zaps and dimmers. The list is completed by the inscrutably titled 'practical box'.

The production company — Avanti co-ordinate the awesome task of getting all the people and all the equipment together at the appointed time, and the genial executive producer, Mike O'Brien, had his work cut out making it all happen. (Which it did without perceptible bother.)


John Ringham gets in some practise while Michel Gemmell lights up.

The Actors: Business and Pleasure

A commercial has a difficult task of choosing faces that are credible yet not too distracting - or the product gets forgotten. After considerable effort at casting, John Ringham was selected as the perfect 'Boss', Gary Rice as the office creep, Emma Myant as the secretary, and Ricky Diamond as the office 'lad'. Each one managed to wring every last ounce from what was already a promising script, and deserve much of the credit for the final result.

If you think you've seen 'the Boss' somewhere else, then it's probably as the long suffering father of Penny in the BBC series 'Just Good Friends'. John Ringham warmed to his role like a true professional, and got so engrossed in 3D Grand Prix that he managed to drive around the first three circuits in pole position in between sequences.

In between takes, it emerged that John spends much of his time writing, and was therefore interested in finding out more about the PCW8256, and he even went as far as suggesting a theme for the next commercial featuring a middle aged actor/writer...... In fact, this completely bears out the Amstrad philosophy on the PCW8256 - for while computer specialists are agonising on determining the nature of the marketplace and the conflict with £3000 systems, potential customers who would never previously have thought of setting foot in a Computerland or First Computer store are lining up, eager to lay hands on their first wordprocessor/computer.

The Good the Bad and the Ugly

On a personal note, I find commercials that use 'real life' customers to be unwatchable -and commercials that fail to extol the practical virtues of the product to be quite

Greg Delaney, Lee Golding and Peter Souter



Malcolm Miller, Ricky Diamond and Emma Myant



The paraphenalia of 35mm movie making



meaningless - although with products like beer, the ever cautious ITCA (the vetting body) would frown upon a tag line to a commercial along the lines of 'OffenSlosh gets you gloriously merry' so the commercial tends to be as watered down as the product.

Computers have been advertised in a variety of indifferent ways. The Barbara Woodhouse training session, the Commodore Elephant, the Hewlett Packard ads all tended to extol a virtue that was by no means proprietory. The Commodore elephant, for example, looks distinctly vunerable to anyone coming along with a bigger memory product (what price a perfectly preserved Mammoth from Siberia, eh?); and anyone can make outrageous claims about software because no-one really has the time to sit and evaluate a business product properly. And when you do, the result is usually very subjective.

The Amstrad 6128 advert manages to extol a couple of typically Amstrad virtues that Amstrad has made almost proprietory in this market, and pointing out the utility of the product at the same time: value for money, and value for money.

Softaware

Amstrad is the first company to advertise software on TV in a sizeable campaign. (Ocean ? Virgin? Global? - Ed) After the indifference of some of the earlier offerings, Amsoft has actually got a few good-uns together under the Amsoft Gold label, prompting the thought that the rest of the range might uncharitably be described as 'base metal' offerings.

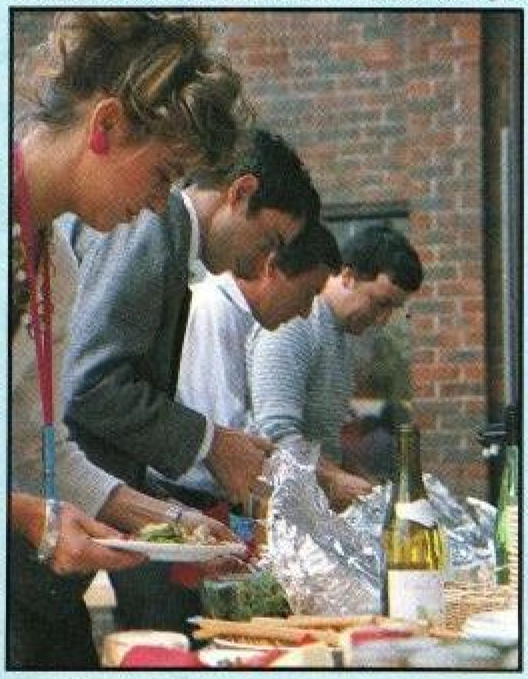
The software ad was shot in between two days of the 6128 commercial, with Dominic Murphy as the ubiquitous Bob Wilson, and definitely not at all anything like Dickie Davies. I must make this clear because the original intention was for him to appear with a white fleck in his hair like the 'real thing' - but the ITCA said this was not on.

I'm glad I don't have to deal with the ITCA for a living, although Greg Delaney insists that the ITCA is a very necessary and wonderful watchdog body with the interests of the general public at heart. (OK, Greg?)

Phased out

The software ad was made up from set pieces, and so was rather easier to shoot than the action sequence of the 6128. The only problem was the synchronisation of the camera shutter with the TV monitor scan rates. The problem is that the scan rate is linked to the crystal reference in the computer - and although near as dammit 25 frames per second - the difference between shutter speed at 25 fps causes a phase difference to appear as a black band travelling up or down the screen. You must have seen them on TV news reports or other programs without our attention to detail.

Various boxes of tricks were plugged in before a solution was found, yet still many feet of film were wasted (about £70 for 400 feet, plus processing) while the camera got up to speed and the phase bar was nudged out of the frame.



... at the trough

The results were actually rather good, as you can see for yourselves if you watch TV-AM.

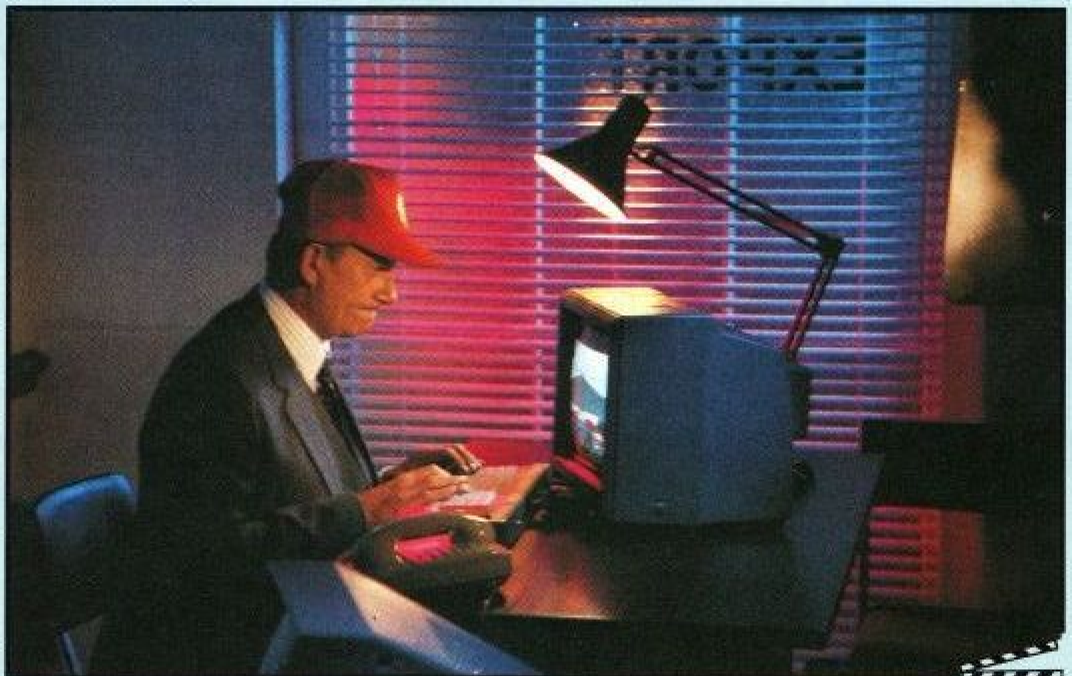
Glitter City

The actual studios were in Shepherds Bush, but we're allowed a little licence in this business. Contrary to the expectations of many, attending a commercial shoot is about as enthralling as watching paint dry (you have to quite a lot of that, too). In fact, it's very much flying the Atlantic, great anticipation but boring once you're in the air.

Like a transatlantic flight, refreshments come along regularly every couple of hours, starting with breakfast, midmorning snacks, lunch, afternoon tea, supper (these events tend to drag into the evening). If some of the accompanying photographs seem to dwell rather heavily on this aspect of the production, it's because the food was one of the more memorable and lasting features.

As Amstrad Marketing Director Malcolm Miller said 'I'll wrap that (censored - Ed) camera around you head if you take another picture of me eating......'. Fair dos, Malcolm did display a decent amount of guilt as he scoffed his 5th cheese roll of the afternoon.

Shooting a commercial is a trial of many things, not the least of which are stamina and patience.



Serious personal computing

ACU

WIN a SEIKO UC-3000 memo diary watch!



Amstrad User and Probe Software are teaming up to challenge YOU to find and recover the treasure in Probe Softwares *NEW* Amstrad release, "THE DEVIL'S CROWN".



SEIKO UC–3000

" . . . as the Pirates slowly remove the Sparkling Stones they feel a cold eerie wind pass through their hair. Suddenly, as the final Stone is removed from the Cursed Golden Crown, a massive Devil, from the darkest depths of Hell, is unleashed, murders all on board and sinks the ship . . . with the treasure".

After many years of careful research the co-ordinates of the pirate ship has been traced and legend speaks of death and evil on board. Do you dare to return to the sunken ship and recover the Seven Jewels which have been scattered around the 40 rooms of the wreck, and replace them in the Crown. Before you recover the jewels you must first prove yourself by replacing each flashing object with the equivalent solid object, also hidden around the ship. Only then is a flashing jewel revealed which must be replaced by a solid jewel.

HOW TO ENTER

All you have to do to win this marvellous prize is to play the Devil's Crown, recover six sets of objects, which are flashing in the Upper Cabin, Main Deck, and then send your answers in on the Official Entry Form. Remember you must recover a Sapphire between objects so your task is not an easy one. Send your answer to:—

"Amstrad User/Probe Software Competition", 155 Mitcham Road, London SW17.

The first correct entry will receive the SEIKO UC–3000, and five runners up will win a copy of the new BOND game (Amstrad Version) "The Adventures of BOND . . . Basildon Bond", starring Russ Abbot.

Amstrad User/Probe Software
Official Competition Entry Form

Name . . . .
Address . . . .
. . . .
. . . . Postcode . . . .
Age. . . . . Tel: No. . . . .

Object 1. is three Golden Bells
Object 2. is three . . . .
Object 3. is three . . . .
Object 4. is three . . . .
Object 5. is three . . . .
Object 6. is three . . . .

GALLUP



4 weeks up to 17/10/1985

	TITLE / Publisher	Last Month			Months in chart	Market Strength
1	WAY OF THE EXPLODING FIST Melbourne House	1	◀▶	664	2	100
2	FRANK BRUNO'S BOXING Elite	2	◀▶		1	55
3	NON TERRAQUEOUS Master Tronic	5	▲	664	2	53
4	CHILLER Master Tronic	4	◀▶	664	2	51
5	FINDERS KEEPERS Master Tronic	3	▼	664	2	46
6	BEACH HEAD US Gold	7	▲	A 664 D	4	36
7	SCRABBLE Leisure Genius	6	▼	664	1	35
8	STARION Melbourne House	11	▲	664	1	32
9	LOCOMOTION Master Tronic	9	◀▶	???	1	26
10	LORDS OF MIDNIGHT Amsoft	-		A 664 D	NE	22
11	DRAGON TORC Hewson Consultants	-		664	NE	21
12	ALIEN 8 Ultimate	12	◀▶	664	4	21
13	HIGHWAY ENCOUNTER Vortex	-		664	NE	20
14	BRIAN JACKS' SUPERSTAR CHALLENGE Martech	10	▼	???	1	18
15	DALEY THOMPSON'S DECATHLON Ocean	16	▲		5	17
16	CODENAME MAT 2 Domark	-		664	NE	17
17	PROJECT FUTURE Gremlin Graphics	-			NE	16
18	AIRWOLF Amsoft	14	▼	A 664 D	1	14
19	RED ARROWS Database	8	▼	???	2	13
20	FIGHTER PILOT Digital Intergration	18	▼	664	1	13

D Available on Disc — 664 CPC 664/6128 Compatible — A Available from Amsoft — ??? Untested

SOFTWARE CHART

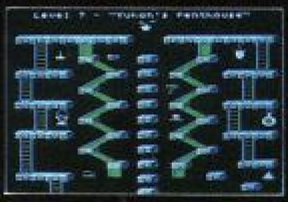
BOUNTY BOB STRIKES BACK!

Twenty-five Levels.

Multi Channel Music.

Dual Joystick Capability.

"Bounty Bob Strikes Back" is the sequel to "Miner 2049er" which was a huge success on the Commodore 64 and Atari machines. Now on the Amstrad, this version features Bob's toughest challenge to date and he needs your help more than ever before to guide him through the mine. The mutant organisms within have multiplied and over run the mine entirely, making it extremely difficult to survive the hazards of the underground passageways. Using high powered special equipment in the twenty-five caverns is Bob's only hope of achieving his objective of securing the mine and defeating the evil plans of Yukon Yohan.



OUT NOW

BEACH-HEAD

Multiscreen 3-D Arcade Action

A peaceful island is being held by a ruthless dictator and his troops. As Chief Commander of land and sea forces in the Pacific, you must obtain a quick naval victory and then invade the island with land forces. If your troops succeed in penetrating the island defence systems, the most difficult challenge still remains; capturing the enemy fortress of Khun-Lin.

Beach-Head is a multiscreen action game which requires different skills and provides new sequences as you progress through the game.



OUT NOW

BRUCE LEE

Twenty secret chambers to explore

Unique multiple player options

Dazzling graphics and animation

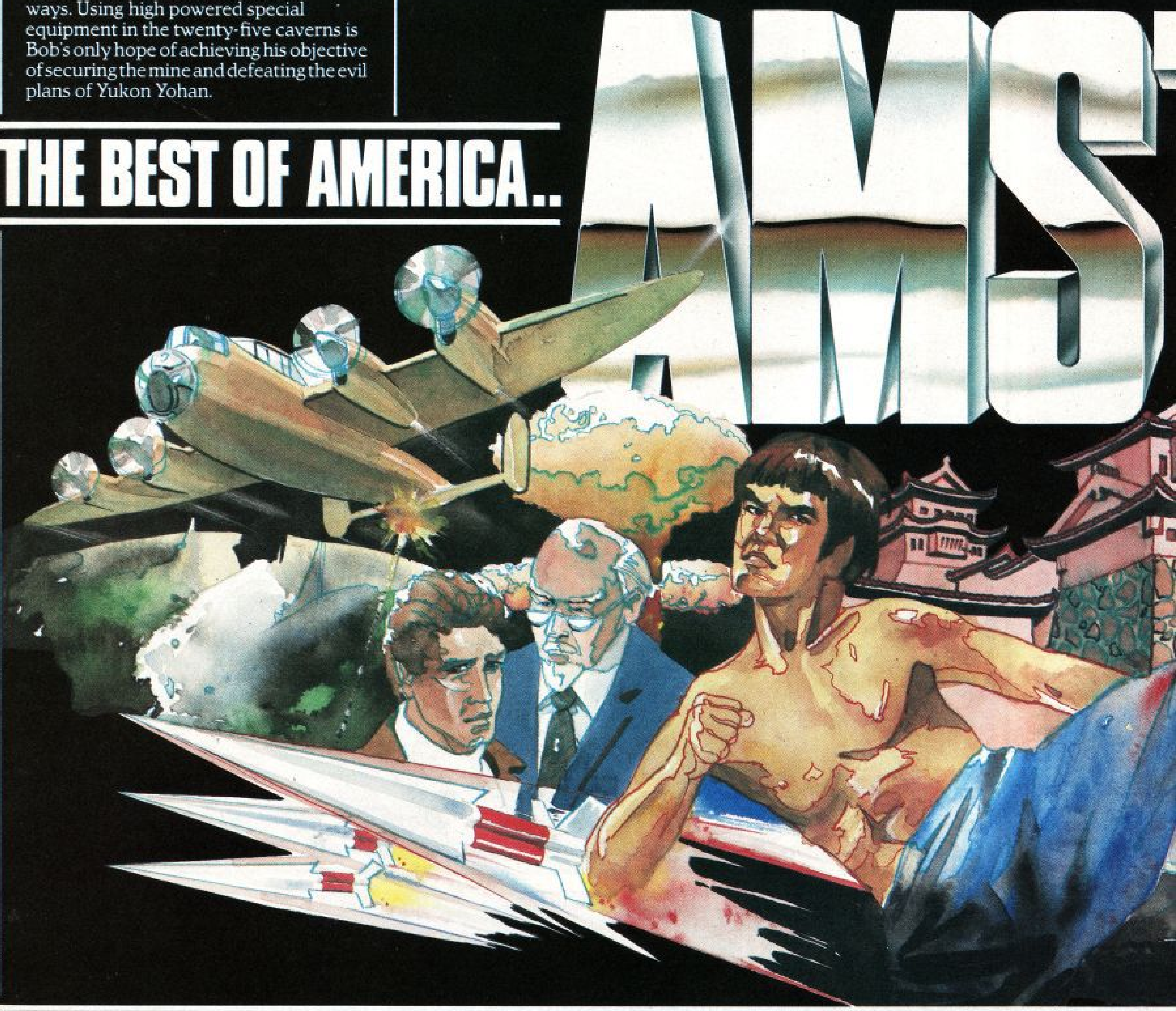
In "Bruce Lee" you will experience the power and the glory of Bruce Lee, one of the greatest masters of the martial arts.

As Bruce Lee, you will confront a barrage of vicious foes. You must penetrate the fortress of the Evil Wizard and claim his fortunes. Destroying the Wizard will earn you immortality and infinite wealth!



OUT NOW

THE BEST OF AMERICA..



U.S. GOLD ON THE AMSTRAD*- ON

RAID!

Gripping Arcade Action

Multiple 3-D Scrolling Screens

The scene is one of World-wide conflict. The only hope of saving the World from nuclear annihilation is an attack by stealth bombers on the launch sites.

As squadron leader, you must lead your troops on a virtual suicide mission; knock-out the launch sites, and proceed to the command headquarters. Armed only with the weapons you carry, you must destroy the defence centre and stop the attack!



OUT NOW

DAMBUSTERS

Superb Graphics and Sound

At 21.15 hours on the evening of May 16th 1943, a flight of specially prepared Lancaster bombers left R.A.F. Scampton for Germany. And so, one of the most daring and courageous raids of the Second World War was underway. Now you have the opportunity to relive the drama and excitement of this famous action via your Amstrad computer. You will take the parts of Pilot, Navigator, Front and Rear Gunners, Bomb Aimer and Flight Engineer as you play this authentic reconstruction of the night's events. The multiple screen action is complemented by a comprehensive package of flight documents and authentic material from the period.



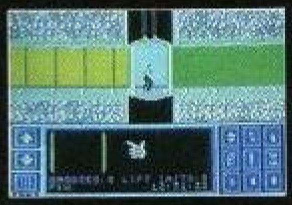
SOON

IMPOSSIBLE MISSION

Game of the Year 1985- British Micro Awards

Message from the Agency computer..... "....Your mission, Agent 4125 is to foil a horrible plot. From an underground laboratory, Elvin, the scientist, is holding the world hostage under threat of nuclear annihilation. You must penetrate his stronghold, avoid his human-seeking robots and find pieces of the security code.

Somersault over the robots or use a precious snooze code to deactivate them long enough to search each room. Use the Agency's computer to unscramble the



OUT NOW

passwords from the code pieces, or try to solve them yourself. You'd better beware.....This mission is stamped IMPOSSIBLE!"



COMING THIS AUTUMN

U.S. GOLD All American Software

U.S. Gold Limited, Unit 10, The Parkway Industrial Centre Heneage Street, Birmingham B7 4LY. Telephone: 021-359 8881 Telex: 337268.

E GREAT GAME AFTER ANOTHER!

*All screen shots as seen on the Commodore 64

Roland Takes a Running Jump



This month Peter Green moves in a mysterious way, but Roland doesn't in our on-going arcade programming feature.

Last month we saw how to get chunks of graphic data onto the screen as quickly as possible by storing them in their encoded form (ie, as the actual data bytes required in the screen RAM by the 6845 video display chip), and then copying them as a rectangular block into the screen memory area. This is not only fast, but it means we can display multi-coloured characters just as quickly as monochrome ones, because the size of the screen data block is identical, however many colours it contains, and the encoding is done in advance, not as the screen is being updated.

We decided to use Mode 1 to compromise between screen resolution and variety of inks available. In this mode, a pixel needs two bits in the display memory for a choice of four colours. To display multi-coloured characters by printing them would need up to three operations in transparent text mode (overprinting three characters, one in each foreground ink), or two operations in TAG (text at graphics cursor) mode: printing one character to set one bit of each pixel as required, then overprinting in OR graphics mode with a second character to set the other bits. Neither system is any good for the sort of speeds we need.

On the move

Now that we can place our graphic blocks, or 'software sprites', on the screen, we have to think about animation. We need a systematic way of controlling the sprite movement.

Well, if we go back to O-Level Physics, we have all the tools we need. Let's consider just one sprite. It has a position, represented by two coordinates (in whatever system we choose): an x coordinate across the screen, and a y coordinate up the screen. We can store these as two variables, and, by altering the values of x and y, place the sprite anywhere on screen with an appropriate bit of program (one that converts x and y to a screen address, then calls the routine we ended up with last month).

Suppose we want our sprite to move smoothly in some direction. This means that one (or both) of the variables x and y have to be altered steadily by a constant amount, each time erasing the sprite at its old position and redrawing it at the position given by the new values of x and y. The amount of change in x and y each time round the 'display loop' can be considered to be the x and y velocities, and we can store these in two more variables, vx and vy. Smooth animation, from the program's point of view, now has the form: erase the old sprite, add vx to x, and add vy to y, to obtain new coordinates. redraw the sprite in its new position and loop back. The only problem with this system is that, quite quickly, the sprite vanishes off the screen.

Bouncing checks

We have to include some kind of checking system, so that our sprites can be made to 'bounce' off obstacles or the edges of the screen. A further problem is that Roland's velocity depends partly on what you're doing with the joystick, and partly on his surroundings. In short, we need to have a system of acceleration. Here acceleration is used in its strict scientific sense of 'a change in velocity', not its popular meaning of 'going faster'.

Acceleration is more complicated to deal with than velocity, but the limited nature of our sprite movements means it isn't too tricky to handle. We're basing our game on established favourites like Manic Miner and Blagger, and in these the animated nasties move back and forth in straight lines. This is easy to handle - for each sprite we store the maximum and minimum x and y values for its path. Each time the sprite moves, its new position is checked against these limits. If the sprite has reached an x or y limit, the acceleration is applied by inverting its velocity in that particular plane: the effect on screen is that the sprite 'bounces', and starts moving in the opposite direction. These 'bouncing points' are decided by the programmer when designing a particular game level.

Roland's acceleration is more difficult. Under joystick control he can move left, right, jump up in the air or stand still. But his movement is restricted by his environment in several ways. Again taking our lead from commercial games, there are a number of 'building blocks' which can be encountered. Let's run through them.

First there are solid walls and floors, which Roland cannot penetrate. I'll call these 'thick' floors, to distinguish them from the 'thin' floors which Roland cannot fall through, but is able to penetrate when jumping up. Then there are the melting floors, which gradually disappear if Roland stands on them. There are conveyor belts, moving either to the left or right. Usually the way these work is that, if you try to move Roland against the direction of travel, he just stands still. If you release the joystick or go in the same direction, he moves with the conveyor at his normal walking speed. All right, in real life his speed when walking would be added to the speed of the conveyor belt, but we are trying to keep things as easy for ourselves as possible.

Finally, we need to keep track of deadly objects, which cause instant death when touched: and treasure objects and the exit from the level, which do not affect Roland's freedom of movement but still have to be recognised. All of these various game elements need to be stored in a kind of map, so that the program knows where Roland is and how he should be moving.

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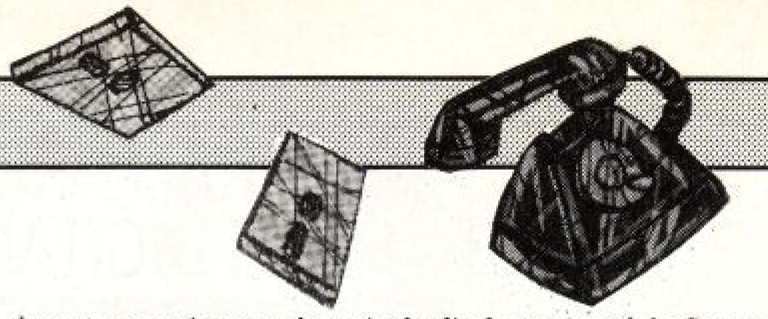
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```
rolacc LD A,(rx)       ;get Roland x coord
       LD C,A          ;put it into C reg
       LD A,(ry)       ;get Roland y coord
       LD B,A          ;put it in B
       INC B           ;go down one square (ie check the 'ground' underfoot)
       CALL peek       ;see what's there
       AND &EC         ;lose irrelevant bits (see text)
       JR Z,fall       ;if zero, then Roland is falling, so ignore joystick
       PUSH AF         ;push 'ground' onto stack
       CALL &BB24      ;KM GET JOYSTICK
       POP DE          ;pop 'ground' off stack into D
       LD HL,rvy       ;point HL to variable for Roland's y velocity
       LD B,0          ;assume zero velocity to start with
       BIT 4,A         ;fire button pressed?
       JR Z,newrvy     ;if not, OK to load y velocity with zero
       LD B,-2         ;else Roland jumps upwards with velocity rvy=-2
newrvy LD (HL),B       ;store new y velocity in (rvy)
       OR D            ;combine 'ground' type and joystick data
       AND &C          ;mask off unwanted bits
       LD HL,rvx       ;point HL to variable for Roland's x velocity
       LD B,0          ;assume zero velocity to start with
       JP PE,newrvx    ;and load this if parity is even (see text for reason)
       LD B,1          ;else load B with 'right' x velocity
       CP 8            ;check if Roland is moving right
       JR Z,newrvx     ;and store this if he is
       LD B,-1         ;otherwise he's moving left, so make B = 'left' velocity
newrvx LD (HL),B       ;store new x velocity in (rvx)
       JR newpos       ;now calculate new positions for all animated objects
fall   LD HL,vy        ;point to y velocity
       INC (HL)        ;simulate gravity
newpos ;the routine to calculate the new positions of all animated objects
       ;goes here (next month)
;****************************************************************************
peek   CALL locate
       LD A,(HL)
       RET
poke   CALL locate
       LD (HL),A
       RET
locate PUSH AF         ;save AF
       PUSH BC         ;save x,y coords
       LD DE,40        ;width of one floor
       LD HL,fldat-41 ;point to start of floor data less 40
addrow ADD HL,DE       ;add on row length
       DJNZ addrow     ;once for each row
       ADD HL,BC       ;B now zero, so this line adds column no.
       POP BC          ;restore BC
       POP AF          ;and AF
       RET             ;HL now points to required byte in fldat table
```

Of Maps and Memory

In the good old bad old days of the 8K PET (you know you're getting old when you can remember 8K PETs), screens were character-mapped. This means that a 40 by 25 text screen literally occupied 40 x 25, or 1000 bytes of memory: the screen memory held the ASCII codes for the characters to be displayed, rather than the actual pixel patterns making up the displayed shapes. It was the job of the hardware to send the right patterns to the electron gun on each pass through the frame, the patterns being fixed in ROM. This was useful as memory was so expensive, but made user-defined characters and all the pixel-based graphics like line-drawing, which you take for granted on your Amstrad, completely impossible. The great thing about it was that the display layout was identical to the 'map' we mentioned above. If you wanted to see what your playing piece was standing on, you just PEEKed the code out of the screen location below him.

In contrast, it is extremely difficult to check out Roland's surroundings by examining the Amstrad's screen memory. One character occupies many bytes in the display map, and the firmware routine to read characters from the screen needs them to be in one ink, not multicoloured like our graphics. Thus for convenience, we set up a section of memory to represent the rows and columns of our playing area: this becomes our x and y coordinate system for placing sprites. We can fill this block of memory with our own invented number codes to represent the layout of floors, walls, treasure, nasties and so on, and use it to check on Roland's possibilities for movement.

Bits and pieces

The numbering system for our game elements is completely arbitrary, so we can choose it to make life convenient for the rest of the programming. First, remember that we need to combine the conveyor belt data with the joystick data to arrive at Roland's true x velocity. The firmware CALL to fetch the current state of the joysticks is &BB24, KM GET JOYSTICK, which returns the state of joystick 0 in the A register of the Z80 CPU. Bit 3 is set if the stick is pushed right, bit 2 is set for left. (What a pity this makes right and left the wrong way round in Figure 1). Note that it's impossible to push the stick left and right at the same time, so these bits cannot both be set to 1, which is important later.

What I've decided to do is to set bits in the memory byte representing a given location to indicate the contents of that location. And obviously the first choice is to set bit 3 for a right-moving conveyor, or bit 2 for a left-moving conveyor. (It isn't obvious? All will be revealed...) Notice again that both bits cannot both be set at the same time. Figure 1 shows the remainder of the assignments, which are completely arbitrary.

As far as Roland's physical speeds go, I chose 1 and -1 to be the horizontal (x) velocities, for left and right respectively. The vertical velocity is somewhat more complicated because we have to consider the force of gravity. If Roland is on solid ground, obviously vy is zero. If there is nothing underfoot, Roland has to fall, and I've done this by arranging for his y velocity to increase by 1 unit each time round the program loop (Negative velocity representing upwards). Note how this makes Roland fall faster and faster until he hits something: we can use the speed of impact to determine how far Roland has fallen and, if necessary, kill him from the impact.

Jumping is now easy. If the player presses the joystick button, make vy -2; this represents an upward leap. The gravity we've programmed in automatically makes the jumping Roland reach a peak and fall back to the ground. Of course, while Roland is jumping or leaping, the joystick is ignored because his legs can't do anything while he's in mid-air.

We are now in a position to calculate Roland's true x and y velocities based on,

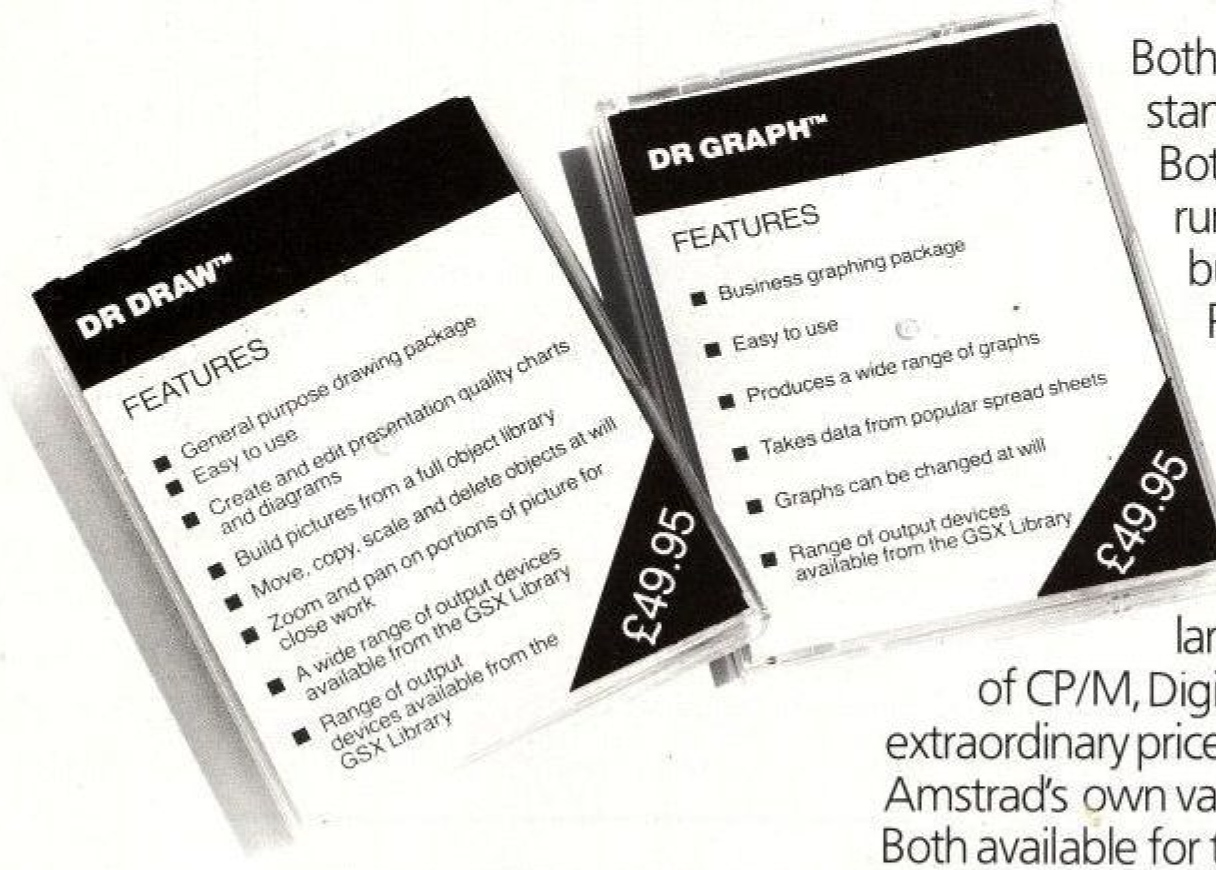
1) what he's standing on;
2) what the player is doing with the joystick.

Listing 1 shows the chunk of machine code I've called rolacc, which works out Roland's acceleration and stores the required values of vx and vy (prefixed r because they're Roland's velocities).

First, the program checks the map to see what's underfoot. The B and C registers are loaded with the current values of ry and rx (Roland's position), and B increased by 1 (coordinates increase downwards). Because we're using a system similar to the PET screen PEEK I described above, the subroutine to examine a map location is also called peek. It first CALLs another subroutine, locate, which converts the coordinates in BC to the right memory byte to look at. I've decided to make the playing area 40 columns wide by 16 deep, with the top left corner having coordinate 1,1. (This makes the playing area the whole screen wide, and gives a space at the bottom for the 'time remaining' display, number of lives left and so on). Obviously the required byte is (map + 40*row + column - 41), the -41 being required because the origin is 1,1, not 0,0.

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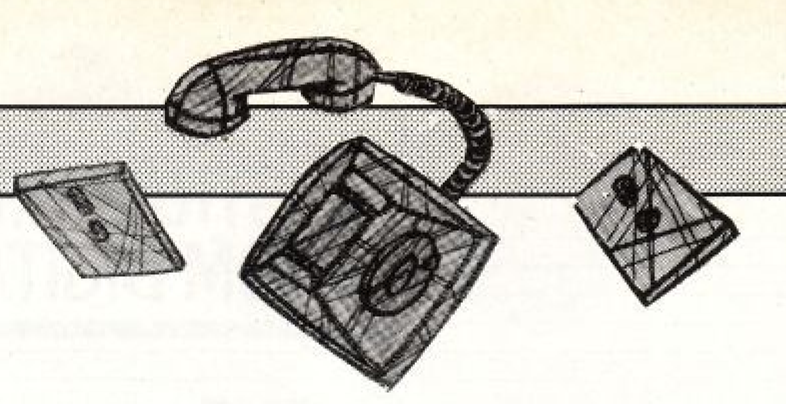
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The routine peek then just fetches the contents of the location into the A register and returns. We're going to need to alter the contents of the map as the game progresses, so I've included the analogous routine to store the A register at a given row/column, and called it poke for obvious reasons.

If Roland's in mid-air, the program jumps to deal with the 'fall'. Notice that we have to remove bits 0,1, and 4 before deciding if a location is 'empty', because Roland is able to move onto treasure, death objects or the exit. As described above, fall simply leaves rvx as it was, and increases rvy by 1.

Otherwise, the type of ground is saved on the stack and the joystick state fetched. The 'ground' is popped into the D register, HL pointed to the variable rvy, and B loaded with zero velocity. If the fire button hasn't been pressed, this is the correct value for rvy, so the program jumps to store it. Otherwise rvy is made equal to a jump value of -2.

Next, the ground and joystick states (D and A) are combined by ORing them together. This is best explained by reference to Figure 2, which shows all the possible starting combinations and results for bits 2 and 3, which we then mask off with AND &C. If the ground was not a conveyor belt, then A holds a number representing the x velocity: 0 for stationary, &8 for right, &4 for left. Furthermore, the F register parity bit will be even for zero velocity, and odd if an x velocity exists (because only bit 2 or bit 3 can be set, never both). If the ground were a conveyor belt and the joystick neutral, the same state applies. But if the joystick direction opposed the conveyor belt, both bits 2 and 3 are set to 1. Two bits set to 1 means even parity: thus the parity test can be used to choose the correct x velocity, which is zero. Of course a zero in A also passes the 'parity even' test, but since the result is to zero A, the x velocity is still the right value.

The various tests following this piece of bit-manipulation trickery simply put the right x velocity into B, and store it in rvx. The program then jumps over the fall routine and into the new position part of the program, which I'll tackle next month.

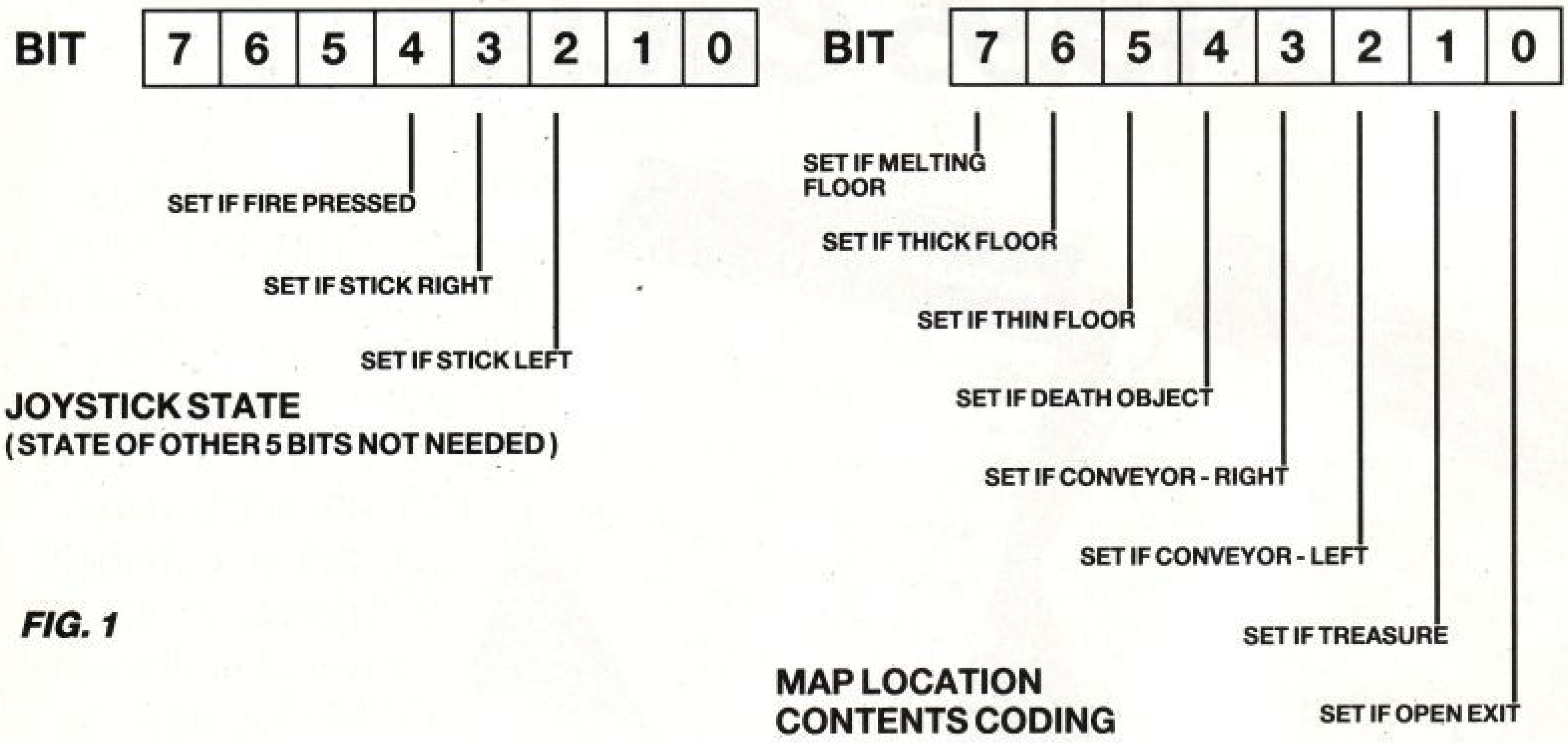


FIG. 1

IF BYTE IS ZERO, MAP LOCATION IS EMPTY SPACE.
IF BIT 7 IS SET, THEN ABOVE SCHEME IS OVERRIDDEN.
BITS 2-6 ARE SET, AND BITS 0-1 FORM A TWO-BIT COUNTER IMPLICATING HOW MUCH THE FLOOR HAS MELTED. THE LOCATION CONTENTS ARE INCREMENTED EACH TIME ROLAND STEPS ON THE LOCATION, AND AFTER FOUR COUNTS THE BYTE CLOCKS ROUND TO ZERO (SPACE); IE. THE FLOOR HAS COMPLETELY MELTED.

FIG. 2

BITS 3&2 OF GRAND TYPE (D)	00	00	00	01	01	01	10	10	10
BITS 3&2 OF JOYSTICK STATE (A)	00	01	10	00	01	10	00	01	10
A OR D	00	01	10	01	01	11	10	11	10
PARITY	EVEN	ODD	ODD	ODD	ODD	EVEN	ODD	EVEN	ODD
BYTE VALUE AFTER PARITY TEST & JUMP	00	01	10	01	01	00	10	00	10
VX (0 = STATIONARY) (-1 = LEFT) (1 = RIGHT)	0	-1	-1	-1	-1	0	1	0	1

(ALL OTHER BITS IN BYTE RESET TO ZERO BY AND &C INSTRUCTION)

ACU

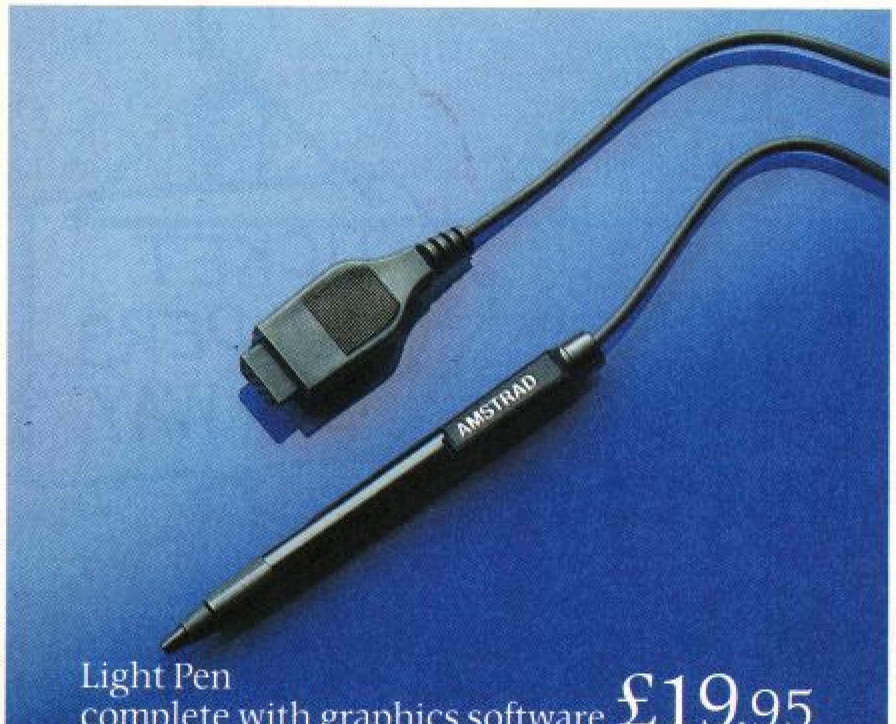
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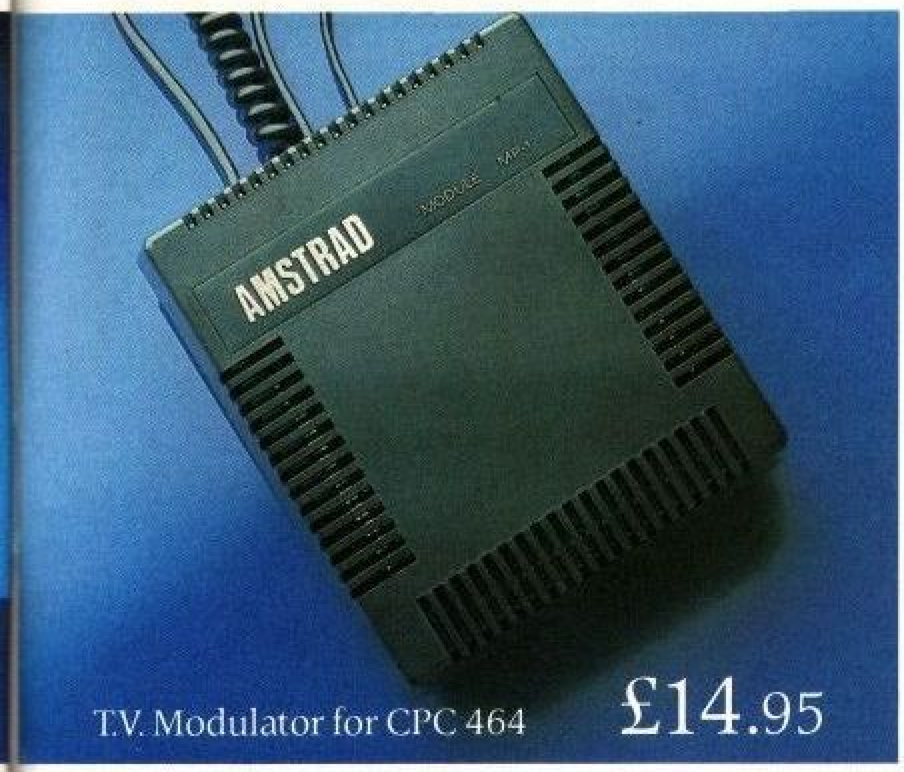




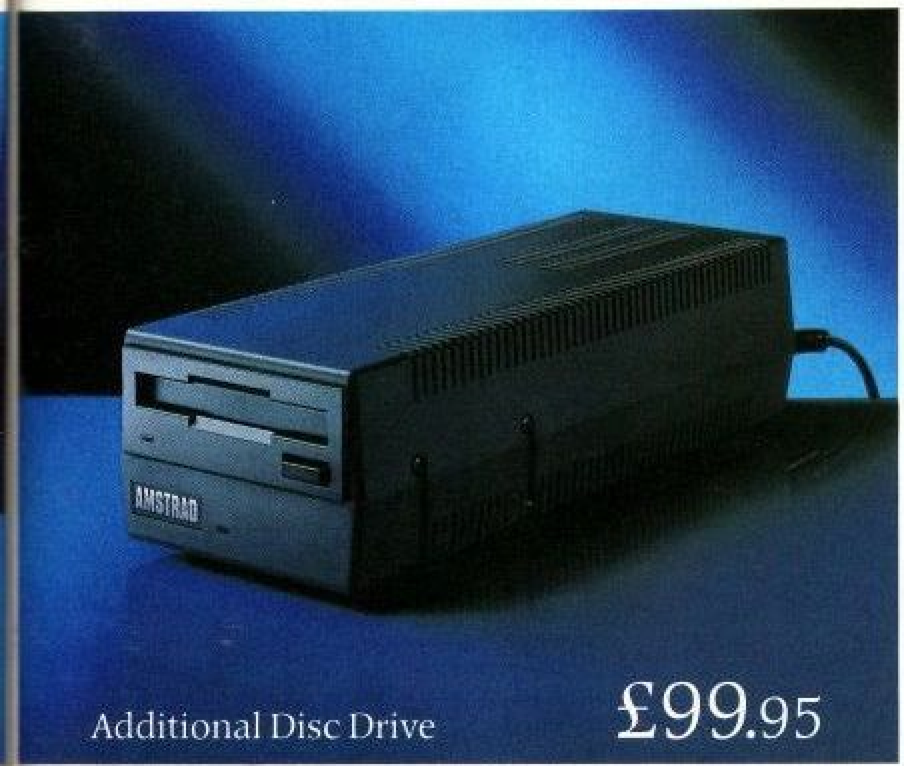


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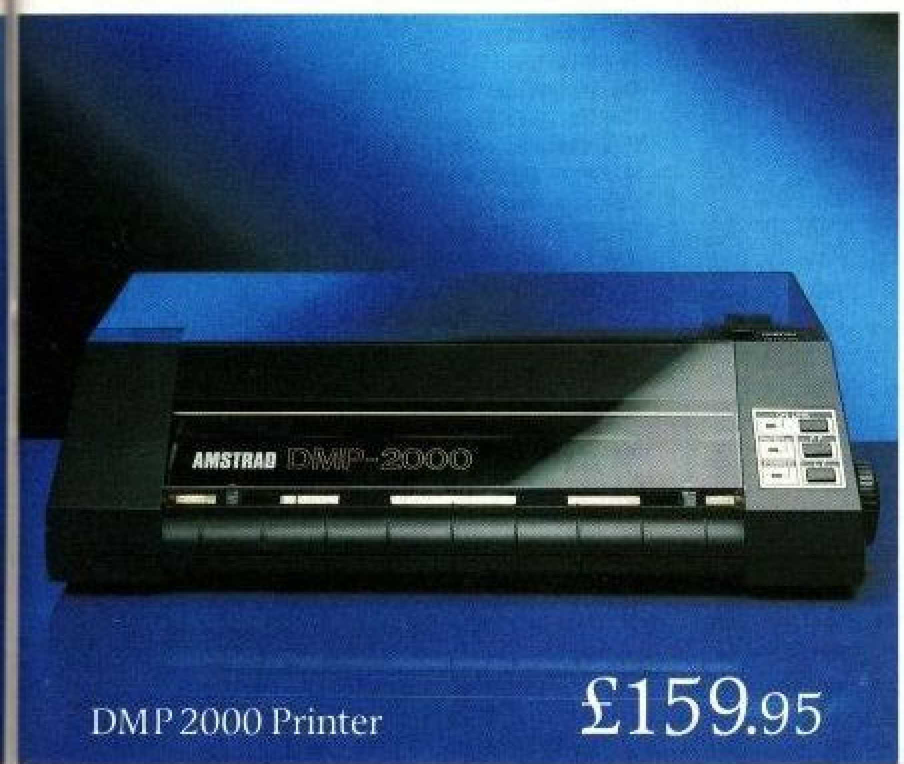
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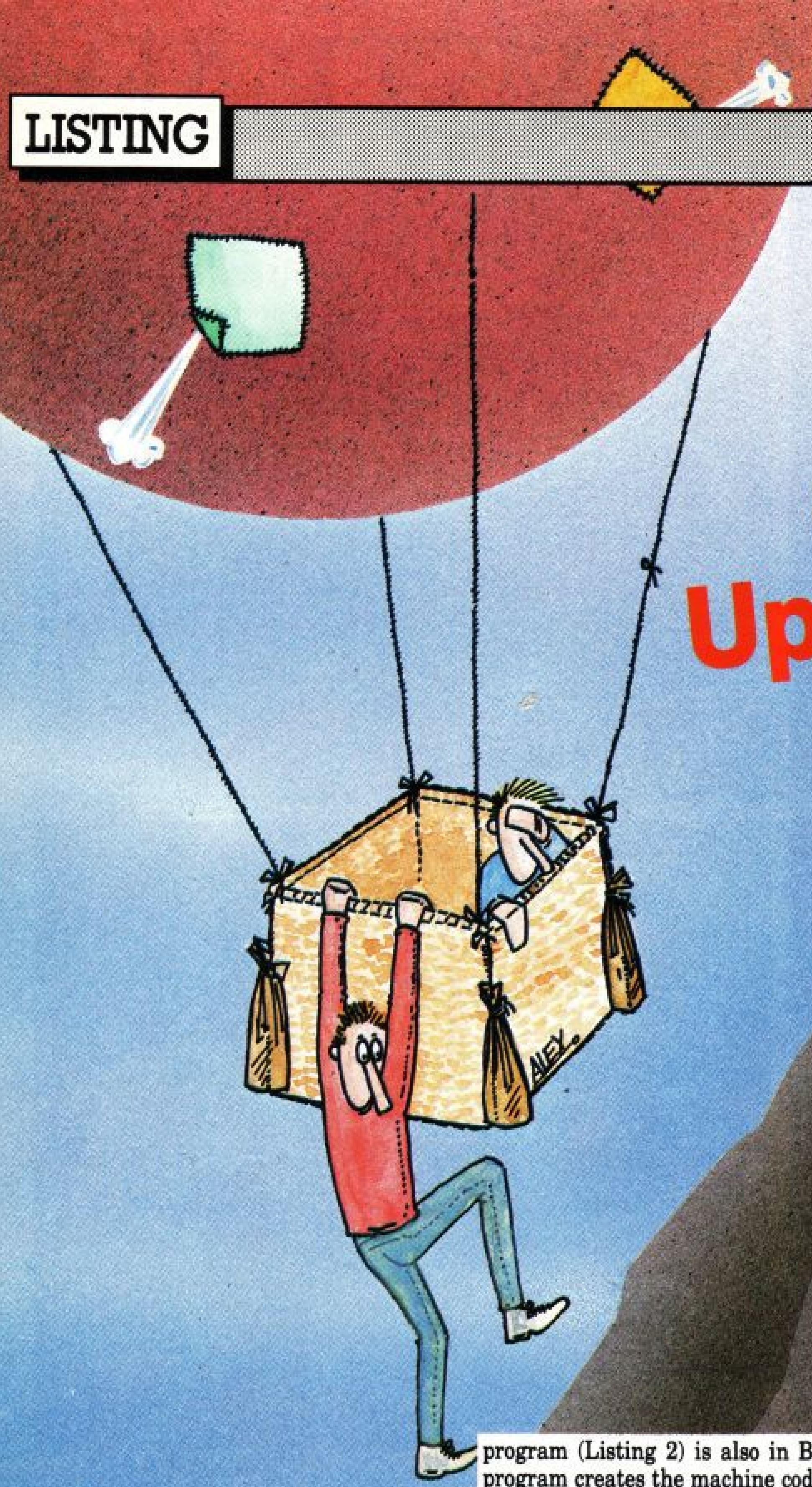
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Up, Up and Away

By Ben Lewis

Ballooning is supposed to be a peaceful, relaxing hobby. Unfortunately, things have gone very wrong. You have to guide your balloon through sixteen difficult screens, negotiating mountains, avoiding aircraft and dodging birds. The game can be played either with a joystick or the keyboard.

How to type the programs in

Balloon is a Basic program which uses machine code subroutines. These are loaded into the computers memory by the Basic program (Listing 1). This is done by line 10. It is necessary for the machine code routine to be saved either on the same disc or on the tape after the Basic program. Since not everyone has an assembler, the second program (Listing 2) is also in Basic. This program creates the machine code you will need to go with Listing 1. If you are using a disc based system you will need to type in the first listing, save it and then reset the computer. Type in the second listing and save it. Then run the second listing. This will create a third (machine code) program on the disc called 'magcode.bin'. Finally, run Listing 1 which will load in magcode.bin and use it.

Tape users will find life a little more complicated. It is easiest to use two tapes. Save the programs to separate tapes. Wind Listing 1 to the end of the program and then swap the tapes. Load Listing 2. Swap the tapes again. You should now have the tape with the Listing 1 on it in the cassette deck wound on to a blank area. In memory you should have the program for Listing 2. Type RUN. If you have not made any mistakes typing in the listing, the Basic program will save a machine machine code program for you. Once this has finished rewind the tape, reset the computer and then type RUN".

Happy Ballooning.

Basic Program - Listing 1

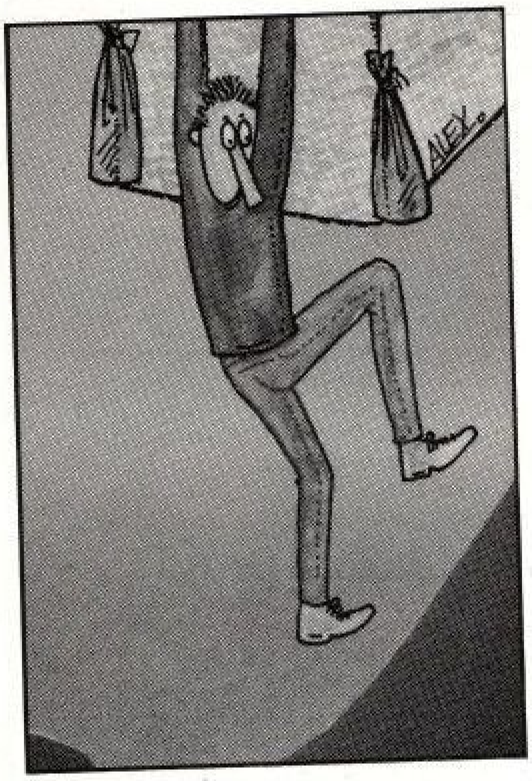
```
10 MEMORY &5E00:LOAD"magcode",&5F00
11 CALL &7D00:POKE &8B*256+399,0:POKE &8
   F*256+139,0:POKE &91*256+299,0:POKE &
   93*256+491,0
15 GOSUB 35000:ENV 1,5,1,1,1,0,60,5,-1,1
20 RESTORE 60020:del%=0:GOSUB 30000:'sta
   rt
25 BORDER 1:INK 0,1:PAPER 0:MODE 0:PEN 1
   :GOSUB 51000
50 GOSUB 20000
155 IF INKEY$="" THEN SOUND 129,0,1
1000 'balloon movement
1020 count=0:v=0:accn%=0
1030 POKE &8500,y:POKE &8501,x
1040 CALL &6000
1045 IF PEEK(&633A)>0 THEN GOTO 40000
1046 IF PEEK(&633F)>0 AND (sheet%=5 OR s
     heet%=12 OR sheet%=21 OR sheet%=28)
      THEN GOTO 40200
1047 accn%=20
1050 IF (INKEY(21)>=0 OR INKEY(76)>=0) T
     HEN SOUND 1,400,10,3,0,0,15:accn%=a
     ccn%-40
1060 v=v-accn%/500
1070 y=y-v
1075 x=x-(INKEY(63)>=0 OR INKEY(75)>=0)+
     (INKEY(71)>=0 OR INKEY(74)>=0):IF s
     heet%>16 THEN x=x-0.5
1076 IF y<2 THEN y=2
1077 IF x>150 THEN x=150 ELSE IF x<2 THE
     N x=2
1080 bonus%=bonus%+(bonus%>0):IF (bonus%
      MOD 15)=0 THEN PLOT bonx,2,6:PLOT
     bonx,4:bonx=bonx+4*(bonus%>0)
1100 GOTO 1030
20000 '***SET UP SCREENS***
20005 SOUND 129,0,1:SOUND 130,0,1
```

```
20010 MODE 0:bonus%=1050:bonx=479:ON sheet% GOSUB 20100,20200,20500,20400,20300,20600,20700,20100,20200,20500,20400,20300,20600,20700,20100,20200,20100,20200,20500,20400,20300,20600,20700,20100,20200,20500,20400,20300,20600,20700,20100,20200,60000
20015 WINDOW #4,1,20,24,25:PAPER #4,6:CLS #4
20020 PEN 4:PAPER 6:LOCATE 2,24:PRINT CHR$(240);CHR$(241);CHR$(242):PEN 15:LOCATE 1,25:PRINT MID$("00000",1,6-LEN(STR$(score)))+MID$(STR$(score),2):PEN 4:LOCATE 10,24:PRINT CHR$(243);CHR$(244);CHR$(245):LOCATE 7,25:PEN 3
20022 PRINT CHR$(254);CHR$(247);CHR$(247);CHR$(247);CHR$(247);CHR$(247);CHR$(247);CHR$(247);CHR$(247):PEN 4
20025 LOCATE 17,24:PRINT CHR$(250);CHR$(251);CHR$(252);CHR$(253):LOCATE 17,25:PEN 15:PRINT life$:PEN 1:PAPER 0
20090 GOSUB 51000:IF sheet%=6 OR sheet%=13 OR sheet%=29 THEN INK 5,0,1:SPEED INK 5,80
20091 POKE &8500,y:POKE &8501,x:POKE &8502,0:POKE &8503,0:CALL &6000:CALL &6000:RETURN
20092 FOR f=0 TO 15:INK f,1:NEXT:RETURN
20100 '**sheet one**
20105 GOSUB 20092
```

```
20110 FOR f=0 TO 160 STEP 4:PLOT f,32,15:DRAW 80,90:NEXT
20120 FOR f=120 TO 480 STEP 4:PLOT f,32,7:DRAW 300,250:NEXT
20125 FOR f=510 TO 700 STEP 4:PLOT f,32,15:DRAW 600,150:NEXT
20130 RANDOMIZE 5:FOR f=62 TO 104 STEP 4:PLOT f,INT(RND*10)+68,4:DRAW 80,90:NEXT
20140 FOR f=236 TO 360 STEP 4:PLOT f,INT(RND*20)+168:DRAW 300,250:NEXT
20142 FOR f=560 TO 640 STEP 4:PLOT f,INT(RND*15)+100,4:DRAW 600,150:NEXT
20145 FOR f=31 TO 39 STEP 2:PLOT 480,f,1:DRAW 510,f:NEXT
20147 IF sheet%=8 OR sheet%=24 OR sheet%=15 OR sheet%=31 THEN POKE &6384,1

20148 IF sheet%=15 OR sheet%=31 THEN POKE &6381,1
20149 x=2:y=150:POKE &637E,1:POKE &637F,1:GOSUB 20091
20150 RETURN
20200 '**sheet two**
20205 GOSUB 20092
20210 FOR f=32 TO 40 STEP 2:PLOT 0,f,12:DRAW 639,f:NEXT
```

```
20220 PLOT 0,36,5:DRAW 260,36:PLOT 0,38:DRAW 260,38:PLOT 0,40:DRAW 260,40
20240 PLOT 300,42,14:DRAW 320,280:DRAW 340,42:PLOT 300,42:DRAW 330,200:PLOT 314,200:DRAW 340,42
20245 IF sheet%>16 THEN FOR f=254 TO 274 STEP 2:PLOT 308,f,3:DRAW 200,f/2+132:NEXT:PLOT 308,254:DRAW 316,254:PLOT 308,274:DRAW 316,274:ELSE FOR f=254 TO 270:PLOT 310-(f-265),f,3:DRAW 280-(f-265)/3,f/4+90:NEXT:PLOT 316,275:DRAW 310,265:PLOT 316,247
```



```
20250 LOCATE 14,20:PAPER 2:PRINT" ":PEN 15:PAPER 4:LOCATE 14,21:PRINT CHR$(207):LOCATE 14,22:PRINT CHR$(207)+CHR$(207)+CHR$(207):PEN 1:PAPER 0

20260 PLOT 340,42,12:DRAW 620,42:PLOT 360,44:DRAW 600,44:PLOT 380,46:DRAW 580,46
20270 PLOT 580,42,1:DRAW 639,42:PLOT 580,44:DRAW 639,44:PLOT 580,46:DRAW 639,46:PLOT 580,48:DRAW 639,48
20280 IF sheet%=9 OR sheet%=25 OR sheet%=16 OR sheet%=32 THEN POKE &6381,1

20281 IF sheet%=16 OR sheet%=32 THEN POKE &6384,1:POKE &637F,1
20290 x=60:y=152:POKE &6380,1:POKE &637E,1:GOSUB 20091
20299 RETURN
20300 '**sheet three**
20305 GOSUB 20092
20310 WINDOW #6,1,20,15,23:PAPER #6,14:CLS #6
```

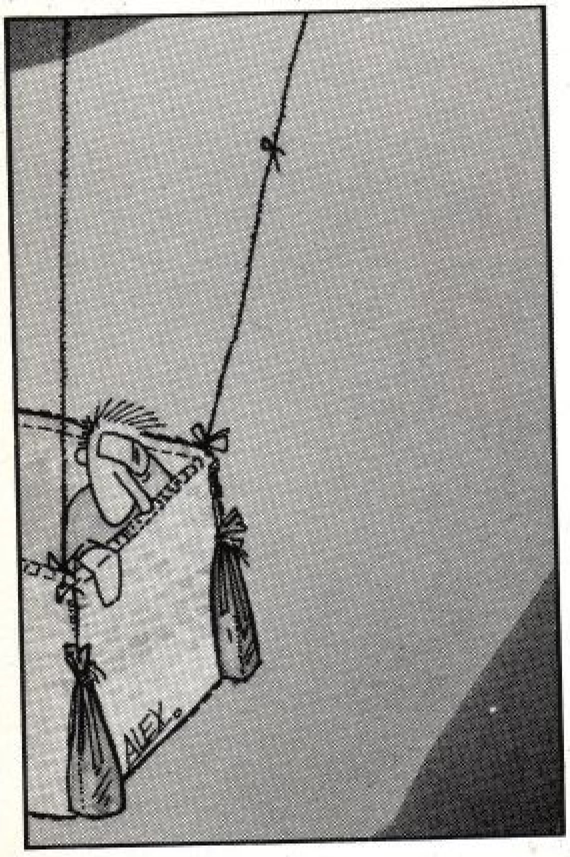
```
20311 PEN 1:PAPER 0
20315 FOR f=0 TO 80 STEP 4:PLOT f,175,5:DRAW f,210+f/20:NEXT:FOR f=0 TO 10 STEP 4:PLOT f,210:DRAW f,250:NEXT:FOR f=242 TO 258 STEP 2:PLOT 0,f:DRAW 440,f+40:NEXT f:FOR f=0 TO 80 STEP 4:PLOT f,256:DRAW 60,280:NEXT
20316 IF sheet%=12 OR sheet%=28 THEN FOR f=242 TO 258 STEP 2:PLOT 0,f:DRAW 500,f+40:NEXT f
20320 FOR f=50 TO 200 STEP 2:PLOT 200,f,0:DRAW 260,f:NEXT:FOR f=50 TO 98 STEP 2:PLOT 260,f:DRAW 360,f:NEXT:FOR f=42 TO 46 STEP 2:PLOT 300,f,1:DRAW 360,f:NEXT:PLOT 300,48,0:DRAW 360,48
20330 PLOT 200,200,7:DRAW 200,50:DRAW 296,50:PLOT 260,200:DRAW 260,98:DRAW 360,98:DRAW 360,50:FOR f=170 TO 200:PLOT f,176:DRAW 200,200:NEXT:FOR f=260 TO 290:PLOT f,176:DRAW 260,200:NEXT
20390 x=10:y=10:POKE &6383,1:POKE &637E,1:GOSUB 20091:FOR f=300 TO 460:PLOT 80,f,0:DRAW 180,f:NEXT
```

```
20399 RETURN
20400 '**sheet four**
20405 GOSUB 20092
20410 PLOT 8,32,3:DRAW 631,32:DRAW 631,395:DRAW 8,395:DRAW 8,32:PLOT 8,34:DRAW 627,34:DRAW 627,397:DRAW 4,397:DRAW 4,32
20420 PLOT 90,90:DRAW 90,395:PLOT 94,90:DRAW 94,395:PLOT 90,240:DRAW 240,240:PLOT 90,242:DRAW 240,242:PLOT 160,32:DRAW 160,160:PLOT 164,32:DRAW 164,160:DRAW 320,160:PLOT 160,162:DRAW 320,162:PLOT 320,160:DRAW 320,320:PLOT 324,320:DRAW 160,320
20425 PLOT 324,160:DRAW 324,320:PLOT 324,322:DRAW 160,322
20430 PLOT 240,90:DRAW 560,90:PLOT 240,92:DRAW 560,92:PLOT 400,90:DRAW 400,395:PLOT 404,90:DRAW 404,395:PLOT 480,320:DRAW 560,320:PLOT 480,322:DRAW 560,322:FOR f=324 TO 330:PLOT 480,f,1:DRAW 560,f:NEXT
20440 IF sheet%=11 OR sheet%=27 THEN POKE &6385,1
20490 x=6:y=6:POKE &637E,1:GOSUB 20091
20499 RETURN
20500 '**sheet five**
20505 GOSUB 20092
20510 FOR f=600 TO 639 STEP 4:PLOT f,32,7:DRAW f,399:NEXT
20515 FOR f=100 TO 160 STEP 2:PLOT 600,f:DRAW 200,f+(160-f)/1.5:NEXT
20520 FOR f=280 TO 340 STEP 2:PLOT 0,f:DRAW 400,f+(300-f)/1.2:NEXT
```

```
20530 FOR f=1 TO 13:PLOT INT(RND*150)+450,INT(RND*36)+160,15:DRAW INT(RND*150)+450,INT(RND*36)+160:PLOT INT(RND*150)+450,INT(RND*36)+160,7:DRAW INT(RND*150)+450,INT(RND*36)+160:NEXT f
20535 x=20:y=290:GOSUB 20560:x=200:y=295:GOSUB 20560:x=300:y=295:GOSUB 20560:x=400:y=310:GOSUB 20560:FOR f=1 TO 6:x=INT(RND*400)+200:y=INT(RND*20)+130:GOSUB 20560:NEXT
20540 FOR f=32 TO 38 STEP 2:PLOT 560,f,1:DRAW 600,f:NEXT
20559 GOTO 20580
20560 PLOT x,y,12:DRAW x-4,y-20:PLOT x,y:DRAW x,y-18:PLOT x,y:DRAW x+8,y-16:PLOT x,y:DRAW x+12,y-14:PLOT x,y:DRAW x+16,y-12
20565 RETURN
20580 IF sheet%=10 OR sheet%=26 THEN POKE &637F,1
```

```
20590 x=2:y=2:POKE &6384,1:POKE &637E,1:GOSUB 20091
20599 RETURN
20600 '**sheet six**
20604 GOSUB 20092
20610 PLOT 8,32,3:DRAW 8,395:DRAW 631,395:DRAW 631,32:DRAW 8,32:PLOT 70,32:DRAW 70,188:PLOT 70,234:DRAW 70,395
20630 RESTORE 20630:PEN 5:FOR f=1 TO 16:READ x,y:LOCATE x,y:PRINT CHR$(246):NEXT:DATA 4,10,4,17,5,10,6,12,7,2,8,8,9,22,10,20,11,5,12,8,13,13,14,3,15,16,16,9,17,21,18,4
20635 PEN 1
20640 PLOT 578,344,3:DRAW 627,344:FOR f=346 TO 352 STEP 2:PLOT 578,f,1:DRAW 627,f:NEXT
```

```
20645 LOCATE 1,24:PEN 4:PAPER 7:PRINT"
       THE MINEFIELD    ":PEN 1:PAPER 0
20650 IF sheet%=13 OR sheet%=29 THEN POK
      E &6385,1
20690 x=6:y=160:POKE &637E,1:GOSUB 20091
20695 INK 5,0,1:SPEED INK 5,80
20699 RETURN
20700 '**sheet seven**
20705 GOSUB 20092
20710 LOCATE 1,24:PEN 6:PAPER 5:PRINT"
      THE HAUNTED HOUSE ":PEN 1:PAPER 0
20715 PLOT 80,86,5:DRAW 80,320:DRAW 320,
      399,3:DRAW 560,320:DRAW 560,32,5
20720 PLOT 80,160:DRAW 480,160:PLOT 240,
      160:DRAW 240,86:PLOT 400,160:DRAW
      400,86:PLOT 400,32:DRAW 560,120:PL
      OT 560,200:DRAW 480,240:DRAW 160,2
      40:DRAW 160,216
20725 PLOT 240,216:DRAW 240,320:PLOT 320
      ,240:DRAW 320,216:PLOT 320,240:DRA
      W 320,216
20730 FOR f=300 TO 308 STEP 2:PLOT 340,f
      ,1:DRAW 380,f:NEXT
20740 IF sheet%=14 OR sheet%=30 THEN POK
      E &637F,1
```



```
20790 x=4:y=50:POKE &637E,1:POKE &6385,1
      :GOSUB 20091
20799 RETURN
30000 SOUND 129,0,1:SOUND 130,0,1
30005 GOSUB 20092:BORDER 1:MODE 0:WHILE
      INKEY$<>"":WEND:CALL &7D10
30010 PAPER 11:CLS:GOSUB 65000:RESTORE 6
      0020
30020 PEN 15:LOCATE 4,18:PRINT"Press '1'
       for":LOCATE 1,19:PRINT"    instr
      uctions":LOCATE 1,21:PEN 7:PRINT"
       Or any other":LOCATE 1,22:PRINT
      "     key  to play":PEN 15
30029 BORDER 2:INK 0,26:INK 1,12:INK 2,9
      :INK 3,17:INK 4,8:INK 5,11:INK 6,2
      4:INK 7,22:INK 8,0:INK 9,15:INK 10
      ,6:INK 11,2:INK 12,14:INK 13,19:IN
      K 14,2:INK 15,20
30030 k$="":WHILE k$="":GOSUB 60000:k$=I
      NKEY$:WEND
30035 IF UPPER$(k$)="I" THEN GOTO 31000
30040 INK 15,2:INK 7,2:LOCATE 4,18:PRINT
      "Start at which":LOCATE 4,19:PRINT
      "   screen ?   ":LOCATE 3,21:PEN 7
      :PRINT"  1. screen 01  ":LOCATE 5,
      22:PRINT"2. screen 17  ":LOCATE 5,
      24:PEN 15:PRINT"Press 1 or 2":INK
      15,20:INK 7,22
30045 WHILE INKEY$<>"":GOSUB 60000:WEND

30046 a$="":WHILE a$="":GOSUB 60000:a$=I
      NKEY$:WEND
30050 IF a$="1" THEN sheet%=1 ELSE IF a$
      ="2" THEN sheet%=17 ELSE 30046
30100 'set up variables
30110 score=0:lives=3:life$=CHR$(248)+CH
      R$(248)+CHR$(248)
30150 RETURN
31000 GOSUB 20092:BORDER 1:PEN 1:PAPER 0
      :MODE 1
31010 GOSUB 60000:PRINT"            HOW TO
       PLAY BALLOON":GOSUB 60000:PRINT"
                    _______________":PRIN
      T:GOSUB 60000
31020 PEN 2:PRINT:PRINT"Guide the balloo
      n through each location,dodging th
      e hazards, and making your way";:G
      OSUB 60000:PRINT"to the yellow lan
      ding platform.":PRINT
31030 GOSUB 60000:PRINT"Be especially ca
      reful of the wind  lateron  in the
       game,  since it can blow  youdras
      tically off course !":PRINT
31040 GOSUB 60000:PRINT"Use the followin
      g controls . .":PRINT
31045 PEN 1:PRINT:PRINT"   ACTION
      KEYBOARD      JOYSTICK":PRINT:PEN 2
31050 GOSUB 60000:PRINT"    Thrust
      [SHIFT]           Fire":GOSUB 60000:P
      RINT:PRINT"   Left            Z
                 Left":GOSUB 60000:PRINT:PR
      INT"   Right            X
       Right"
31052 GOSUB 60000:PEN 1:PRINT:PRINT:GOSU
      B 60000:PRINT"           [PRESS
      A KEY]"
31053 PLOT 36,40,3:DRAW 603,40:GOSUB 600
      00:DRAW 603,168:DRAW 36,168:DRAW 3
      6,40
31055 INK 0,1:INK 1,15:INK 2,23:INK 3,8
31056 IF INKEY$<>"" THEN GOSUB 60000:GOT
      O 31056
31060 WHILE INKEY$="":GOSUB 60000:WEND:G
      OTO 30005
35000 REM **initial initialisation**
35001 ENV 1,5,3,1,1,0,65,5,-3,1
35002 ENV 2,15,-1,20
35010 SYMBOL 240,0,&31,&4A,&22,&12,&4A,&
      31,0
35020 SYMBOL 241,0,&8C,&52,&12,&12,&52,&
      8C,0
35030 SYMBOL 242,0,&E7,&94,&94,&E7,&A4,&
      97,0
35040 SYMBOL 243,0,&E3,&94,&E4,&94,&94,&
      E3,0
35050 SYMBOL 244,0,&25,&B5,&B5,&AD,&AD,&
      24,0
35060 SYMBOL 245,0,&26,&29,&24,&22,&29,&
      C6,0
35070 SYMBOL 246,&99,&5A,&3C,&FF,&FF,&3C
      ,&5A,&99
35080 SYMBOL 247,0,0,&11,&11,0,&FF,&FF,0
35090 SYMBOL 248,&18,&3C,&3C,&3C,&18,0,&
      18,&18
35095 SYMBOL 249,&3F,&47,&93,&AB,&A5,&45
      ,&39,&1
35100 SYMBOL 250,0,&8,&8,&8,&8,&8,&F,0
35110 SYMBOL 251,0,&74,&24,&22,&22,&21,&
      71,0
35120 SYMBOL 252,0,&5E,&50,&9C,&90,&10,&
      1E,0
35130 SYMBOL 253,0,&60,&90,&40,&20,&90,&
      60,0
35140 SYMBOL 254,&70,&50,&71,&1,&40,&7F,
      &7F,&40
35150 SYMBOL 255,&F0,&FC,&FE,&FE,&FF,&FF
      ,&FF,&FF
35200 RETURN
40000 REM **colision**
40010 IF PEEK(&633A)=192 THEN GOTO 41000
       ELSE GOTO 50000
40200 REM **SHEET 3 colide**
40210 POKE &6383,1:CALL &6000:CALL &6000
      :IF y>156 THEN GOTO 41000 ELSE GOT
      O 50000
41000 REM **LANDED OK**
41010 sheet%=sheet%+1:POKE &638E,0:POKE
      &638F,0:POKE &6390,0:POKE &6391,0:
      POKE &6392,0:POKE &6393,0:POKE &63
      94,0:POKE &6395,0
41020 score=score+200:LOCATE 1,25:PEN 15
      :PAPER 6:PRINT MID$("00000",1,6-LE
      N(STR$(score)))+MID$(STR$(score),2
      )
41025 bonus%=bonus%/10:WHILE bonus%>0:bo
      nus%=bonus%+(bonus%>0):score=score
      +10:SOUND 1,bonus%+100,6,4:LOCATE
      1,25:PRINT MID$("00000",1,6-LEN(ST
      R$(score)))+MID$(STR$(score),2):PL
      OT bonx,2,6:PLOT bonx,4:bonx=bonx-
      2.7
41027 WEND:PEN 1:PAPER 0
41030 GOTO 50
50000 REM **CRASH**
50010 SOUND 129,0,1:SOUND 1,150,300,15,2
      ,0,8:FOR f=1 TO 25:FOR g=1 TO 15:O
      UT &BD00,1:INK g,INT(RND*27):OUT &
      BD00,0:NEXT g:NEXT f
50020 lives=lives-1:MODE 0:GOSUB 51000:'
      restore colours
50040 IF lives=0 THEN GOTO 50300
50045 CALL &7D10:life$=MID$(life$,2)
50050 MODE 0:GOTO 50
50300 MODE 0:GOSUB 20092:WINDOW #5,4,16,
      5,17:PAPER #5,14:PAPER 0:PEN 14:CL
      S #5:LOCATE 3,5:PRINT CHR$(249):LO
      CATE 16,5:PRINT CHR$(255):PEN 4:PA
      PER 14
50305 SYMBOL 240,&E0,&CF,&D1,&D4,&52,&6C
      ,&31,&F:SYMBOL 241,0,&FF,&FF,&FF,&
      FF,&FF,&FF,&FF:SYMBOL 242,0,&F8,&F
      C,&FE,&FE,&FE,&FC,&F8:PEN 14:PAPER
       0:LOCATE 4,17
50306 PRINT CHR$(240);CHR$(241);CHR$(241
      );CHR$(241);CHR$(241);CHR$(241);CH
      R$(241);CHR$(241);CHR$(241);CHR$(2
      41);CHR$(241);CHR$(241);CHR$(241);
      CHR$(242):PEN 4:PAPER 14
50310 LOCATE 6,8:PRINT"GAME OVER":LOCATE
       8,11:PRINT"SCORE":LOCATE 8,13:PRI
      NT MID$("00000",1,6-LEN(STR$(score
      )))+MID$(STR$(score),2):PEN 1:PAPE
      R 0
50320 GOSUB 51000:FOR f=1 TO 4000:NEXT:G
      OTO 15
51000 INK 0,1:INK 1,24:INK 2,20:INK 3,6:
      INK 4,26:INK 5,0:INK 6,2:INK 7,3:I
      NK 8,10:INK 9,12:INK 10,1:INK 11,1
      6:INK 12,18:INK 13,22:INK 14,13:IN
      K 15,15:RETURN
60000 REM **MUSIC**
60010 del%=del%+1:IF del%>25 THEN RESTOR
      E 60020:del%=1
```

```
60015 READ a,b,c:SOUND 1,a/4,c/1.5,0,1:S.
      OUND 2,b/4,c/1.5,0,1:RETURN
60020 DATA 716,0,70,426,358,70,478,379,3
      5,568,478,17,506,426,17,478,379,35
      ,426,358,35,716,0,70,506,426,70,63
      8,478,70,676,478,70,851,0,70,638,5
      06,70,716,568,35,851,716,17,758,63
      8,17,536,676,35,506,676,35,716,638
      ,35,758,0,17,716,0,17,758,638,35
60030 DATA 758,568,35,716,0,70,0,0,70
60035 DATA 0,0,0,0,0,0,0
65000 REM ** DRAW BALLOON **
65010 RESTORE 65100:FOR f=1 TO 22:READ a
      ,b,c,d:FOR g=0 TO 9:PLOT a+g,b-g,1
      3:DRAW c+g,d-g:NEXT g:NEXT f:SOUND
       129,0,1:SOUND 130,0,1:RETURN
65100 DATA 40,250,80,350,80,350,120,325,
      120,325,60,300,60,300,100,275,100,
      275,40,250,120,250,160,350,160,350
      ,200,250,140,300,180,300,260,350,2
      20,250,220,250,280,250,340,350,300
      ,250,300,250,360,250, 380,250,420,
      350,420,350,460,350,460,350,420,25
      0,420,250
65101 DATA 380,250,460,350,500,350,500,3
      50,460,250,460,250,420,250,490,250
      ,530,350,530,350,550,250,550,250,5
      90,350
```

MACHINE CODE LOADER PROGRAM -LISTING 2

```
1 REM ** HEXLOADER FOR BALLOON M/C **
2 GOSUB 100:' ** CHECK DATA **
5 RESTORE 10010:MEMORY &5E00
10 addr=&5F00:FOR f=1 TO 241*20+13
20 READ a$:a=VAL("&"+a$):IF a<>0 THEN PO
   KE addr,a:addr=addr+1 ELSE READ a$,b$
   :a=VAL("&"+a$):b=VAL("&"+b$):addr=a*2
   56+b:f=f+2
30 NEXT f
40 SAVE"magcode",b,&5F00,14000
50 STOP
100 DIM a(241):RESTORE 20000:FOR f=1 TO
    241:READ a$:a(f)=VAL("&"+a$):NEXT f
110 RESTORE 10010:FOR f=1 TO 241:tot=0:F
    OR g=1 TO 20:READ a$:tot=tot+VAL("&"
    +a$):NEXT g:IF tot<>a(f) THEN PRINT"
    ERROR IN LINE";10000+f*10:STOP ELSE
    NEXT f
120 RETURN
10000 '** M/C DATA **
```

```
10010  DATA 3F,3F,3F,3F,3F,3F,3F,3F,3F,3
       F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F
10020  DATA 33,33,33,33,33,C0,3F,0F,3F,3
       F,3F,3F,2F,0F,0F,1F,3F,3F,3F,3F
10030  DATA 3F,3F,3F,3F,3F,3F,3F,3F,3F,3
       F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F
10040  DATA 3F,3F,3F,3F,3F,3F,3F,3F,3F,3
       F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F
10050  DATA 3F,3F,3F,3F,3F,3F,3F,3F,3F,3
       F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F
10060  DATA 3F,3F,3F,3F,3F,3F,3F,33,33,3
       3,95,3F,0F,0F,1F,3F,3F,3F,3F,3F
10070  DATA 3F,3F,3F,3F,3F,3F,3F,3F,3F,3
       F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F
10080  DATA 3F,3F,3F,3F,3F,3F,3F,3F,3F,3
       F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F
10090  DATA 3F,3F,3F,3F,3F,3F,3F,3F,3F,3
       F,3F,3F,3F,3F,3F,3F,3F,3F,3F,3F
10100  DATA 3F,3F,3F,3F,3F,3F,3F,3F,3F,3
       F,3F,33,62,3F,3F,3F,3F,3F,3F,3F
```

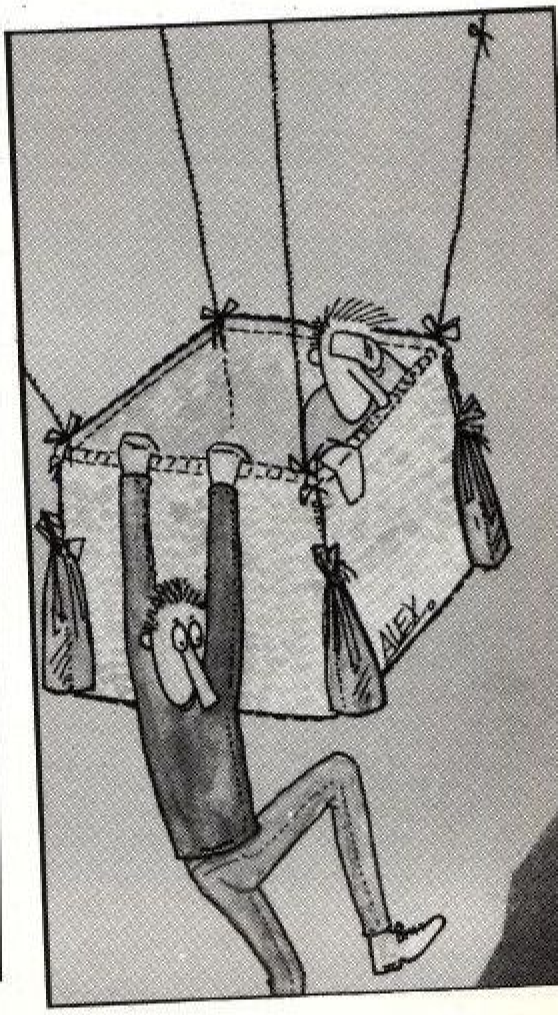
```
10110  DATA 00,60,00,CD,F8,61,21,7E,63,1
       1,8E,63,FD,21,6E,63,E5,D5,CD,53
10120  DATA 60,CD,64,60,CD,15,62,CD,42,6
       0,CD,32,62,CD,42,60,CD,4F,62,CD
10130  DATA 42,60,CD,6C,62,CD,42,60,CD,8
       9,62,CD,42,60,CD,A6,62,CD,42,60
10140  DATA CD,C3,62,CD,42,60,D1,E1,C9,C
       1,D1,E1,13,23,FD,23,E5,D5,C5,CD
10150  DATA 53,60,CD,64,60,C9,FD,7E,00,6
       0,56,FE,00,60,58,C8,3D,FD,77,00
10160  DATA 60,5D,FE,00,60,5F,C0,3E,01,7
       7,C9,1A,47,7E,FE,00,60,69,CA,76

10170  DATA 60,1A,EE,01,12,AF,77,CD,7E,6
       0,C9,78,FE,00,60,79,C8,CD,85,60
10180  DATA C9,CD,C3,61,CD,9B,60,C9,CD,C
       3,61,CD,9B,60,CD,0B,61,CD,57,61
10190  DATA CD,FA,60,CD,C3,61,CD,9B,60,C
       9,DD,21,22,63,3A,38,63,87,47,DD
10200  DATA 23,DD,23,10,FA,DD,5E,00,60,A
       D,DD,56,01,3A,36,63,47,E5,C5,CD
10210  DATA BF,60,C1,E1,23,10,F6,C9,3A,3
       7,63,47,1A,FE,00,60,C6,CA,CC,60
10220  DATA CD,DF,60,AE,D5,11,00,60,D0,0
       8,77,19,D2,DA,60,11,50,C0,19,D1
10230  DATA 13,10,E5,C9,F5,C5,4F,AE,A9,C
       A,F7,60,DD,21,39,63,3A,38,63,47
10240  DATA DD,23,10,FC,7E,DD,77,00,60,F
       7,C1,F1,C9,DD,21,39,63,3A,38,63
10250  DATA 47,DD,23,10,FC,AF,DD,77,00,6
       1,0A,C9,11,5A,63,3A,38,63,47,13
10260  DATA 13,10,FC,1A,6F,13,1A,1B,67,7
       E,23,23,E5,2B,E5,21,38,63,46,21
10270  DATA 47,63,23,23,10,FC,77,E5,DD,E
       1,E1,7E,FE,00,61,35,CA,4B,61,DD
10280  DATA 77,01,21,5A,63,3A,38,63,47,2
       3,23,10,FC,C1,71,23,70,C9,D1,3A
10290  DATA 20,63,6F,3A,21,63,67,C3,1C,6
       1,DD,21,9E,63,3A,38,63,47,DD,23
10300  DATA 10,FC,DD,7E,00,61,66,DD,21,B
       2,63,FE,00,61,6C,CA,73,61,DD,21
```

```
10310  DATA 6F,61,3A,38,63,47,C5,DD,7E,0
       0,61,7B,3C,47,DD,23,DD,23,10,FA
10320  DATA C1,10,F1,DD,7E,00,61,89,3D,D
       D,23,DD,23,DD,46,00,61,91,04,DD
10330  DATA 70,00,61,95,B8,FA,BB,61,DD,2
       3,DD,23,10,FA,DD,5E,00,61,A2,DD
10340  DATA 56,01,DD,21,22,63,3A,38,63,8
       7,47,DD,23,DD,23,10,FA,DD,73,00
10350  DATA 61,B7,DD,72,01,C9,06,01,DD,7
       0,00,61,C0,C3,99,61,DD,21,47,63
10360  DATA 3A,38,63,47,DD,23,DD,23,10,F
       A,DD,5E,00,61,D4,DD,56,01,CD,DB
10370  DATA 61,C9,7B,E6,07,87,87,87,C6,C
       0,67,7A,CB,3F,6F,06,00,61,EA,7B
10380  DATA E6,F8,4F,CB,21,CB,10,09,09,0
       9,09,09,C9,3E,04,32,36,63,3E,14
10390  DATA 32,37,63,3E,01,32,38,63,11,0
       0,62,09,85,DD,21,20,63,DD,73,00
10400  DATA 62,11,DD,72,01,C9,3E,0A,32,3
       6,63,3E,0E,32,37,63,3E,02,32,38
10410  DATA 63,11,00,62,26,87,DD,21,20,6
       3,DD,73,00,62,2E,DD,72,01,C9,3E
10420  DATA 0A,32,36,63,3E,0A,32,37,63,3
       E,03,32,38,63,11,00,62,43,89,DD
10430  DATA 21,20,63,DD,73,00,62,4B,DD,7
       2,01,C9,3E,0A,32,36,63,3E,0E,32
10440  DATA 37,63,3E,04,32,38,63,11,00,6
       2,60,8B,DD,21,20,63,DD,73,00,62
10450  DATA 68,DD,72,01,C9,3E,06,32,36,6
       3,3E,18,32,37,63,3E,05,32,38,63
10460  DATA 11,00,62,7D,8D,DD,21,20,63,D
       D,73,00,62,85,DD,72,01,C9,3E,0D
10470  DATA 32,36,63,3E,0A,32,37,63,3E,0
       6,32,38,63,11,00,62,9A,8F,DD,21
10480  DATA 20,63,DD,73,00,62,A2,DD,72,0
       1,C9,3E,08,32,36,63,3E,0A,32,37
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10490  DATA 63,3E,07,32,38,63,11,00,62,B
       7,91,DD,21,20,63,DD,73,00,62,BF
10500  DATA DD,72,01,C9,3E,0A,32,36,63,3
       E,14,32,37,63,3E,08,32,38,63,11
10510  DATA 00,62,D4,93,DD,21,20,63,DD,7
       3,00,62,DC,DD,72,01,C9,00,63,21
10520  DATA 93,00,63,25,65,00,63,27,65,0
       0,63,29,6D,00,63,2B,69,00,63,2D
10530  DATA 71,00,63,2F,6D,00,63,31,75,0
       0,63,33,6F,00,63,36,0A,14,08,00
10540  DATA 63,3B,73,00,63,3D,20,00,63,3
       F,75,C0,8A,00,63,43,79,00,63,49
10550  DATA 6B,50,14,14,14,14,14,14,01,8
       9,14,14,14,14,14,14,00,63,5C,02
10560  DATA 85,02,87,02,89,02,8B,02,00,6
       3,66,02,8F,02,91,02,93,00,63,B4
10570  DATA 02,00,63,B6,01,00,63,B9,65,0
       4,00,63,BC,02,00,63,BF,67,00,63
10580  DATA C1,69,00,63,C3,6B,02,00,63,C
       6,01,00,63,C9,6D,02,00,63,CC,01
10590  DATA 00,63,CF,6F,02,00,63,D2,01,0
       0,63,D5,71,02,00,63,D8,01,00,63
10600  DATA DB,73,03,00,63,DE,01,00,63,E
       1,75,00,63,E3,77,03,00,63,E6,01
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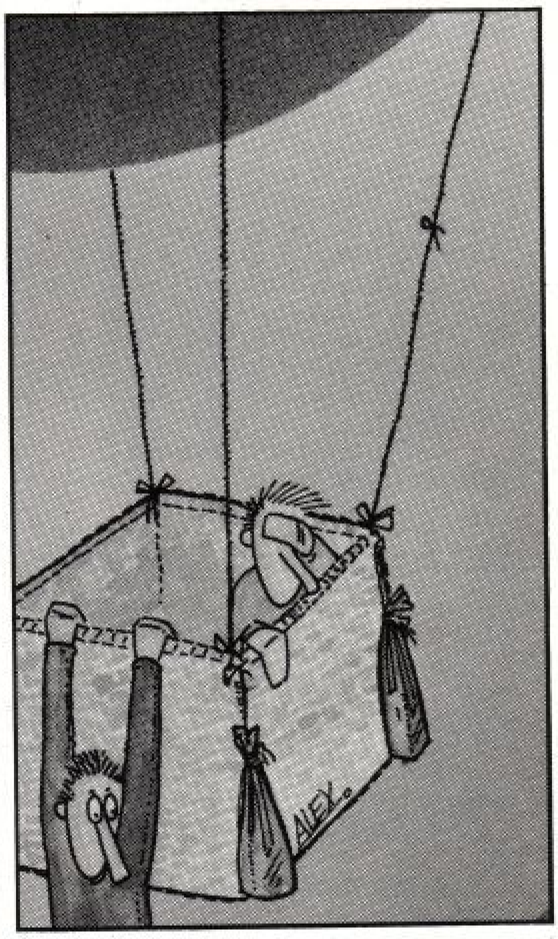
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       A,8A,EF,CF,EF,EF,8A,8A,00,65,78
10650  DATA 0C,14,00,67,04,10,30,30,10,0
       0,67,0C,14,00,67,11,20,30,30,30
10660  DATA 30,10,00,67,19,28,00,67,1F,1
       0,10,20,30,30,30,00,67,2B,10,30
10670  DATA 30,30,30,30,30,30,00,67,34,1
       4,00,67,37,14,10,30,30,30,30,30
10680  DATA 30,30,30,28,00,67,46,20,30,3
       0,30,30,30,30,30,30,00,67,53,14
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10700 DATA 30,30,30,00,67,6C,14,00,67,74,20,30,30,30,20,28,00,67,84,20
10710 DATA 00,67,8C,14,0E,00,69,04,10,30,30,10,00,69,0D,28,00,69,11,20
10720 DATA 30,30,30,30,10,00,69,1F,10,10,20,30,30,30,00,69,28,14,00,69
10730 DATA 2B,10,30,30,30,30,30,30,30,00,69,35,28,00,69,38,10,30,30,30
10740 DATA 30,30,30,30,30,00,69,46,20,30,30,30,30,30,30,30,30,14,00,69
10750 DATA 56,20,30,30,30,30,30,30,00,69,60,14,00,69,65,20,20,10,30,30
10760 DATA 30,00,69,6D,28,00,69,74,20,30,30,30,20,00,69,84,20,00,69,8C
10770 DATA 14,0E,00,6B,04,10,30,30,10,00,6B,11,20,30,30,30,30,10,00,6B
10780 DATA 1F,10,10,20,30,30,30,28,00,6B,29,28,00,6B,2B,10,30,30,30,30
10790 DATA 30,30,30,00,6B,38,10,30,30,30,30,30,30,30,30,28,00,6B,43,14
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10810 DATA 30,30,30,30,30,30,00,6B,61,28,00,6B,65,20,20,10,30,30,30,00
10820 DATA 6B,74,20,30,30,30,20,28,00,6B,84,20,00,6B,8C,14,0E,00,6D,00
10830 DATA 03,03,03,03,03,03,54,54,54,00,6D,0C,02,03,03,03,FC,A9,A8,00
10840 DATA 6D,17,A8,03,03,03,03,00,6D,22,03,03,03,03,54,00,6D,2B,54,03
10850 DATA 03,56,FC,FC,FC,41,C7,45,BC,16,03,FC,FC,FC,FC,82,8A,CF,28,3C
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10870 DATA 04,04,04,24,04,04,04,00,6D,64,14,0A,00,6F,00,20,30,30,30,10
10880 DATA 10,10,10,30,30,30,20,00,6F,0F,10,30,64,64,64,64,64,30,10,00
10890 DATA 6F,1C,10,30,30,CC,30,CC,30,CC,30,30,30,00,6F,2A,30,30,30,30
10900 DATA 98,30,98,30,30,30,30,30,00,6F,38,30,30,30,30,30,30,98,64,30
10910 DATA 30,30,30,F0,F0,30,30,30,64,64,64,64,98,30,30,30,30,F0,F0,30
10920 DATA 30,30,64,64,64,64,64,30,30,30,30,A0,A0,20,30,30,30,30,30,30
10930 DATA CC,30,30,30,30,00,6F,71,20,30,30,30,30,30,30,30,30,30,00,6F
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11050 DATA 00,73,5D,20,70,58,78,52,7A,3F,00,73,68,A0,0C,B4,03,B5,3F,00
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11160 DATA 10,00,79,61,10,10,20,30,30,30,30,30,30,30,30,30,30,10,00,79
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11200 DATA C8,14,14,00,7B,06,20,20,30,10,00,7B,1B,30,30,20,00,7B,2D,10
11210 DATA 30,30,30,00,7B,40,10,30,30,30,30,30,10,10,00,7B,51,10,10,30
11220 DATA 30,30,30,30,30,30,30,20,30,10,00,7B,64,30,30,30,18,18,18,18
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11240 DATA 24,24,24,30,30,00,7B,83,30,30,30,30,30,30,30,10,00,7B,8E,20
11250 DATA 20,30,30,30,30,30,30,30,20,20,20,00,7B,9E,20,30,00,7B,A5,30
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11530 DATA 14,74,14,74,14,75,14,75,14,75,14,75,14,75,14,76,14,76,14,76
11540 DATA 14,76,14,76,14,77,14,77,14,77,14,77,14,77,14,77,14,76,14,76
11550 DATA 14,76,14,76,14,76,14,75,14,75,14,75,14,75,14,74,14,74,14,74
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11620 DATA 14,38,14,37,14,36,14,35,14,34,14,33,14,32,14,31,14,30,14,2F
11630 DATA 14,2E,14,2D,14,2C,14,2B,14,2A,14,29,14,28,14,27,14,26,14,25
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11680  DATA A8,22,A8,25,A8,28,A8,2B,A8,2
       E,A8,31,A6,33,A4,35,A3,38,A0,39
11690  DATA 9E,3B,9C,3D,9A,3F,98,41,96,4
       3,94,45,92,47,90,49,8D,4A,8B,4C
11700  DATA 89,4E,86,4F,83,50,81,52,7F,5
       4,7D,56,7B,58,78,59,76,5B,74,5D
11710  DATA 71,5E,70,61,6E,63,6C,65,6A,6
       7,6A,6B,69,6E,67,70,65,72,64,75
11720  DATA 62,77;61,7A,60,7D,5E,7F,5C,8
       1,5A,83,59,86,57,88,56,8B,C8,00
11730  DATA 8B,00,31,46,30,46,2F,46,2F,4
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11740  DATA 2B,49,2A,49,29,49,29,4A,28,4
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11750  DATA 24,4C,24,4D,24,4E,23,4E,22,4
       E,22,4F,22,50,22,51,21,51,20,51
11760  DATA 20,52,20,53,1F,53,1E,53,1D,5
       3,1D,54,1D,55,1D,56,1C,56,1B,56
11770  DATA 1B,57,1B,58,1B,59,1B,5A,1A,5
       A,1A,5B,1A,5C,1A,5D,1A,5E,19,5E
11780  DATA 19,5F,19,60,19,61,19,62,18,6
       2,18,63,18,64,18,65,18,66,18,67
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11820  DATA 26,78,27,78,28,78,29,78,2A,7
       8,2B,78,2C,78,2D,78,2E,78,2F,78
11830  DATA 30,78,31,78,32,78,32,77,33,7
       7,34,77,35,77,35,76,35,75,36,75
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11850  DATA 3E,72,3E,71,3F,71,40,71,41,7
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11860  DATA 43,6D,44,6D,45,6D,46,6D,46,6
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11870  DATA 48,68,48,67,48,66,48,65,49,6
       5,49,64,49,63,49,62,49,61,4A,61
11880  DATA 4B,61,4B,60,4B,5F,4C,5F,4C,5
       E,4C,5D,4C,5C,4C,5B,4C,5A,4C,59
11890  DATA 4B,59,4B,58,4B,57,4A,57,49,5
       7,49,56,49,55,48,55,47,55,47,54
11900  DATA 47,53,46,53,45,53,45,52,45,5
       1,44,51,44,50,44,4F,43,4F,42,4F
11910  DATA 42,4E,41,4E,40,4E,40,4D,3F,4
       D,3E,4D,3E,4C,3E,4B,3D,4B,3C,4B
11920  DATA 3C,4A,3B,4A,3A,4A,3A,49,39,4
       9,38,49,37,49,37,48,36,48,35,48
11930  DATA 34,48,34,47,33,47,32,47,32,4
       6,C8,00,8F,00,50,06,4E,06,4E,08
11940  DATA 4E,0A,4E,0C,4E,0E,4D,0F,4D,1
       1,4D,13,4D,15,4C,16,4C,18,4C,1A
11950  DATA 4C,1C,4C,1E,4B,1F,4B,21,4B,2
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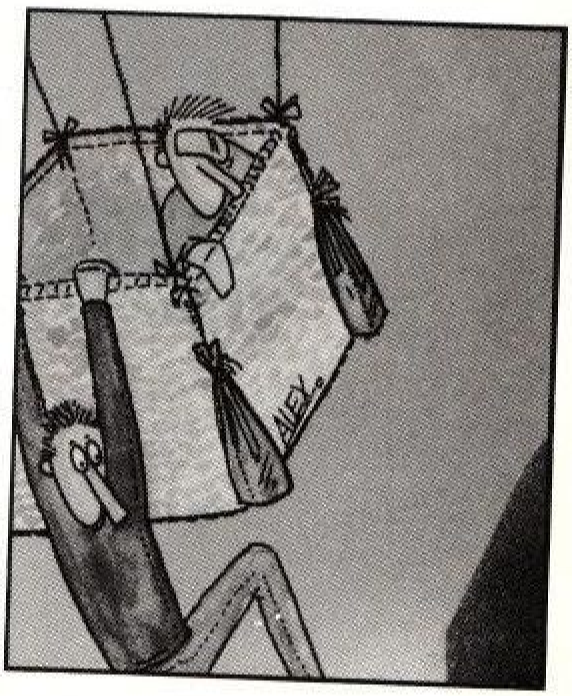
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11990  DATA 48,64,48,66,49,67,49,69,49,6
       B,49,6D,49,6F,49,71,4A,72,4A,74
12000  DATA 4A,76,4A,78,4A,7A,4B,7B,4B,7
       D,4B,7F,4B,81,4C,82,4C,84,4E,84
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12010  DATA 4E,86,C8,00,91,00,5D,89,5D,8
       8,5D,87,5D,86,5C,86,5C,85,5C,84
12020  DATA 5C,83,5C,82,5B,82,5B,81,5B,8
       0,5B,7F,5B,7E,5B,7D,5A,7D,5A,7C
12030  DATA 5A,7B,5A,7A,5A,79,59,79,59,7
       8,59,77,59,76,59,75,58,75,58,74
12040  DATA 58,73,58,72,58,71,57,71,57,7
       0,57,6F,57,6E,57,6D,56,6D,56,6C
12050  DATA 56,6B,56,6A,56,69,55,69,55,6
       8,55,67,55,66,55,65,54,65,54,64
12060  DATA 54,63,54,62,54,61,53,61,53,6
       0,53,5F,53,5E,53,5D,52,5D,52,5C
12070  DATA 52,5B,52,5A,52,59,51,59,51,5
       8,51,57,51,56,51,55,51,54,50,54
12080  DATA 50,53,50,52,50,51,50,50,4F,5
       0,4F,4F,4F,4E,4F,4D,4F,4C,4E,4C
12090  DATA 4E,4B,4E,4A,4E,49,4E,48,4D,4
       8,4D,47,4D,46,4D,45,4D,44,4C,44
12100  DATA 4C,43,4C,42,4C,41,4C,40,4B,4
       0,4B,3F,4B,3E,4B,3D,4B,3C,4A,3C
12110  DATA 4A,3B,4A,3A,4A,39,4A,38,49,3
       8,49,37,49,36,49,35,49,34,48,34
12120  DATA 48,33,48,32,48,31,48,30,48,2
       F,47,2F,47,2E,47,2D,47,2C,47,2B
12130  DATA 46,2B,46,2A,46,29,46,28,46,2
       7,45,27,45,26,45,25,45,24,45,23
```

```
12140  DATA 45,22,44,22,44,21,44,20,44,1
       F,44,1E,44,1D,43,1D,43,1C,43,1B
12150  DATA 43,1A,43,19,43,18,43,17,42,1
       7,42,16,42,15,42,14,42,13,42,12
12160  DATA 42,11,42,10,42,0F,42,0E,42,0
       D,42,0C,41,0C,41,0B,41,0A,41,09
12170  DATA 41,08,41,07,41,06,41,05,41,0
       4,C8,00,93,00,62,4F,60,4E,5E,4D
12180  DATA 5C,4C,59,4C,57,4B,54,4B,51,4
       B,4F,4C,4C,4C,4A,4D,49,4F,47,50
12190  DATA 45,51,43,52,42,54,42,57,43,5
       9,45,5A,46,5C,48,5D,4A,5E,4D,5E
12200  DATA 50,5E,52,5F,55,5F,58,5F,5A,5
       E,5D,5E,5F,5D,62,5D,65,5D,67,5C
12210  DATA 69,5B,6C,5B,6D,59,70,59,72,5
       8,75,58,78,58,7A,57,7D,57,80,57
12220  DATA 83,57,86,57,88,58,8B,58,8E,5
       8,8F,5A,91,5B,93,5C,95,5D,97,5E
12230  DATA 98,60,9A,61,9B,63,9B,66,9D,6
       7,9F,68,9F,6B,9F,6E,9E,70,9C,71
12240  DATA 9B,73,99,74,97,75,96,77,95,7
       9,93,7A,90,7A,8E,7B,8D,7D,8B,7E
12250  DATA 88,7E,86,7F,84,80,7F,80,7B,8
       0,78,81,74,81,70,81,6D,80,69,80
12260  DATA 66,7F,62,7F,5D,7F,59,7E,54,7
       E,50,7D,4C,7C,47,7C,44,7A,40,79
```

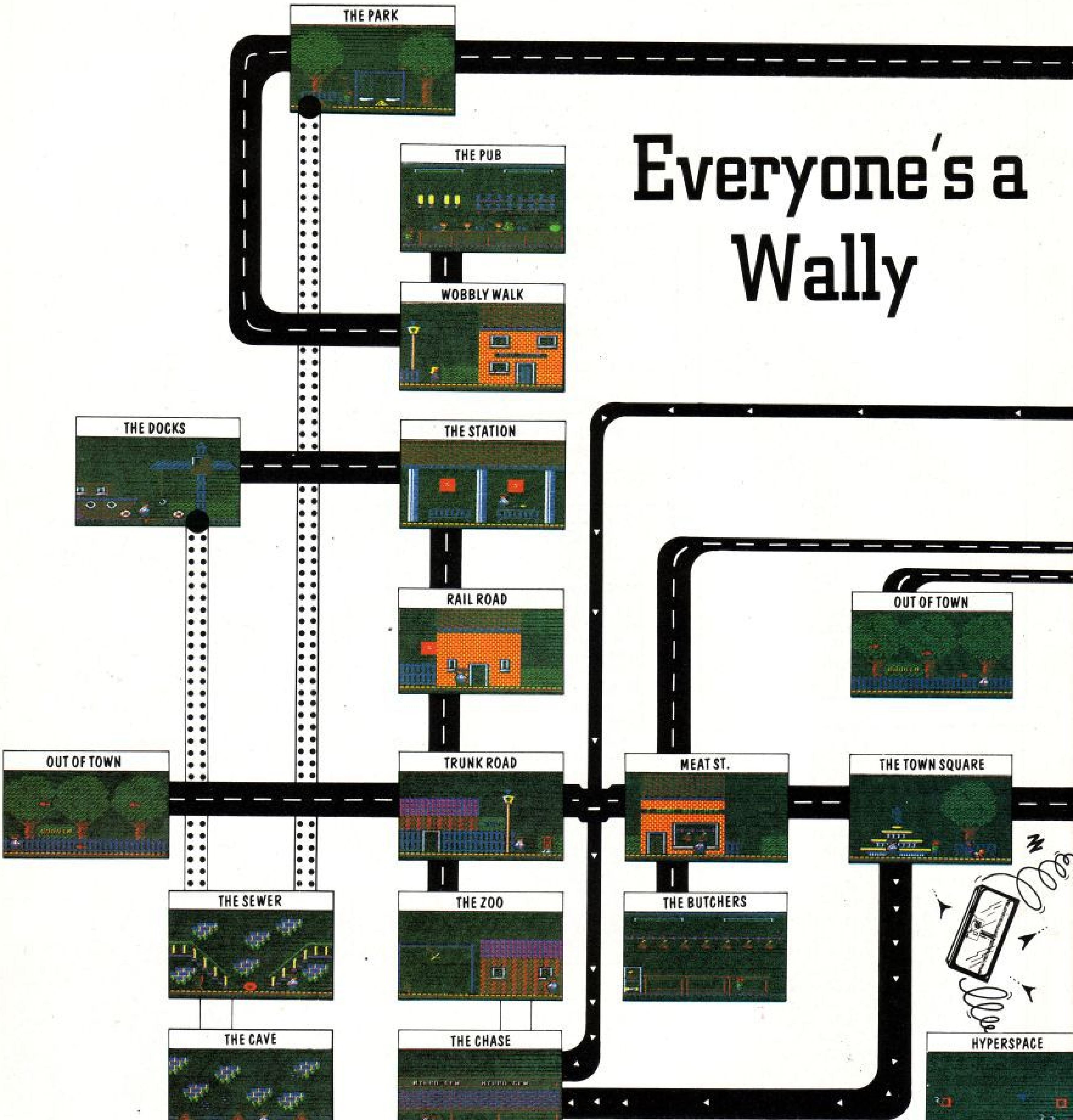
```
12270  DATA 3C,78,38,77,35,75,31,74,2E,7
       2,2C,6F,2A,6C,28,69,25,67,22,62
12280  DATA 20,5E,1E,5A,1D,55,1C,50,1B,4
       B,19,47,17,43,16,3E,19,3B,1A,36
12290  DATA 1B,31,1C,2D,1E,2A,21,28,23,2
       5,24,21,27,1F,2A,1D,2D,1B,30,19
12300  DATA 33,17,37,16,3A,15,3D,14,40,1
       3,43,12,47,12,4B,12,4E,11,52,11
12310  DATA 56,11,5A,11,5F,11,60,13,63,1
       3,65,14,67,15,69,16,6B,17,6C,19
12320  DATA 6D,1B,6E,1D,70,1E,70,21,71,2
       3,71,26,70,28,6E,29,6D,2B,6B,2C
12330  DATA 69,2D,67,2E,65,2F,62,2F,60,3
       0,5D,30,5A,30,57,30,55,2F,52,2F
12340  DATA 50,2E,4E,2D,4C,2C,4A,2B,49,2
       9,48,27,48,24,4A,23,4D,23,4E,21
12350  DATA 4E,1E,4F,1C,54,1B,56,19,58,1
       7,5A,15,5C,13,5F,12,61,10,64,0F
12360  DATA 67,0E,6B,0E,6E,0D,72,0D,75,0
       C,79,0C,80,0C,84,0D,88,0E,8B,10
12370  DATA 8F,11,93,12,95,15,98,17,9A,1
       A,9B,1E,9B,23,9A,27,99,2B,97,2E
```

```
12380  DATA 94,30,93,34,90,36,8D,38,8B,3
       B,87,3C,84,3E,7F,3E,7D,40,79,40
12390  DATA 76,41,73,42,70,43,6C,43,69,4
       2,65,42,61,42,5D,42,5B,40,59,3E
12400  DATA 59,3E,5B,3C,5E,3B,60,39,64,3
       9,67,3A,6B,3A,6D,3C,71,3C,73,3E
12410  DATA 76,3F,78,41,7A,43,7C,45,7D,4
       8,7B,4A,7A,4D,78,4D,78,50,75,50
12420  DATA 72,50,6F,50,6D,4F,6A,4F,67,4
       F,65,50,C8,**END**
12430 '
20000  DATA 04EC,0471,04EC,04EC,04EC,049
       E,04EC,04EC,04EC,0503,0953,09BF,0A
       17,0CF1,096D,089F,09DE,0BC2,0AAC,0
       93A,0A02,097F,0A08,0A1F,0787,0633,
       0A5C,075D,0772,09A8,0875,093A,0A59
       ,07D7,090B,0972,09D3,0649,05AA,056
       1,073B,0513,064B,063A,05C2,0799,05
       8A,06B2
20010  DATA 0722,056E,0875,04EF,043D,05F
       D,02F6,05C1,05AE,06B2,0623,0756,08
       58,0C6F,0E64,0A85,02BA,0310,0381,0
       3D3,0408,0455,033A,0336,0392,03BC,
       03F1,04DD,02E8,0339,03AD,0415,03C4
       ,046C,03DF,0316,0B9E,03AC,025A,03D
       2,05A8,0543,07F8,0594,04AB,0366,02
       64,04C9
20020  DATA 05C9,0680,0573,04B3,0772,073
       F,06C6,074B,066D,04A2,0BA8,0B5C,0B
       4F,07C6,0D21,0BE3,0495,038F,034D,0
       393,039A,0474,04A9,03BF,0387,037F,
       040E,0453,0489,0403,04E1,0685,0757
       ,0A19,06A7,04E3,04C5,0559,0364,04E
       8,0662,0668,066D,06F2,05AB,01F9,02
       0B,0232
20030  DATA 028F,02F3,0357,03BB,041F,048
       3,04E7,053D,055B,056A,055A,0522,04
       BF,045B,03F7,0393,032F,02CB,0267,0
       21C,0203,05DF,0763,084F,0876,083E,
       0846,088F,04AE,0473,046D,0471,0493
       ,04D1,052D,0591,05F5,0659,06A5,06C
       D,06E7,06ED,06C1,0699,063B,05D7,05
       73,050F
20040  DATA 04B9,03B6,0456,04F2,058A,064
       A,0712,07DA,0862,0889,0825,07C1,07
       5D,06F9,0695,0631,05CD,0569,0505,0
       4A1,043D,03D9,0375,0311,04C8,0623,
       062F,073D,07FD,090B,0A2F,0A75,09BE
       ,081A,0624,03EC,02D1,0357,04A6,05B
       B,0583,047F,0457,053C,0713,0794,06
       94,064A
20050  DATA 078f,0529
```



ACU

Everyone's a Wally

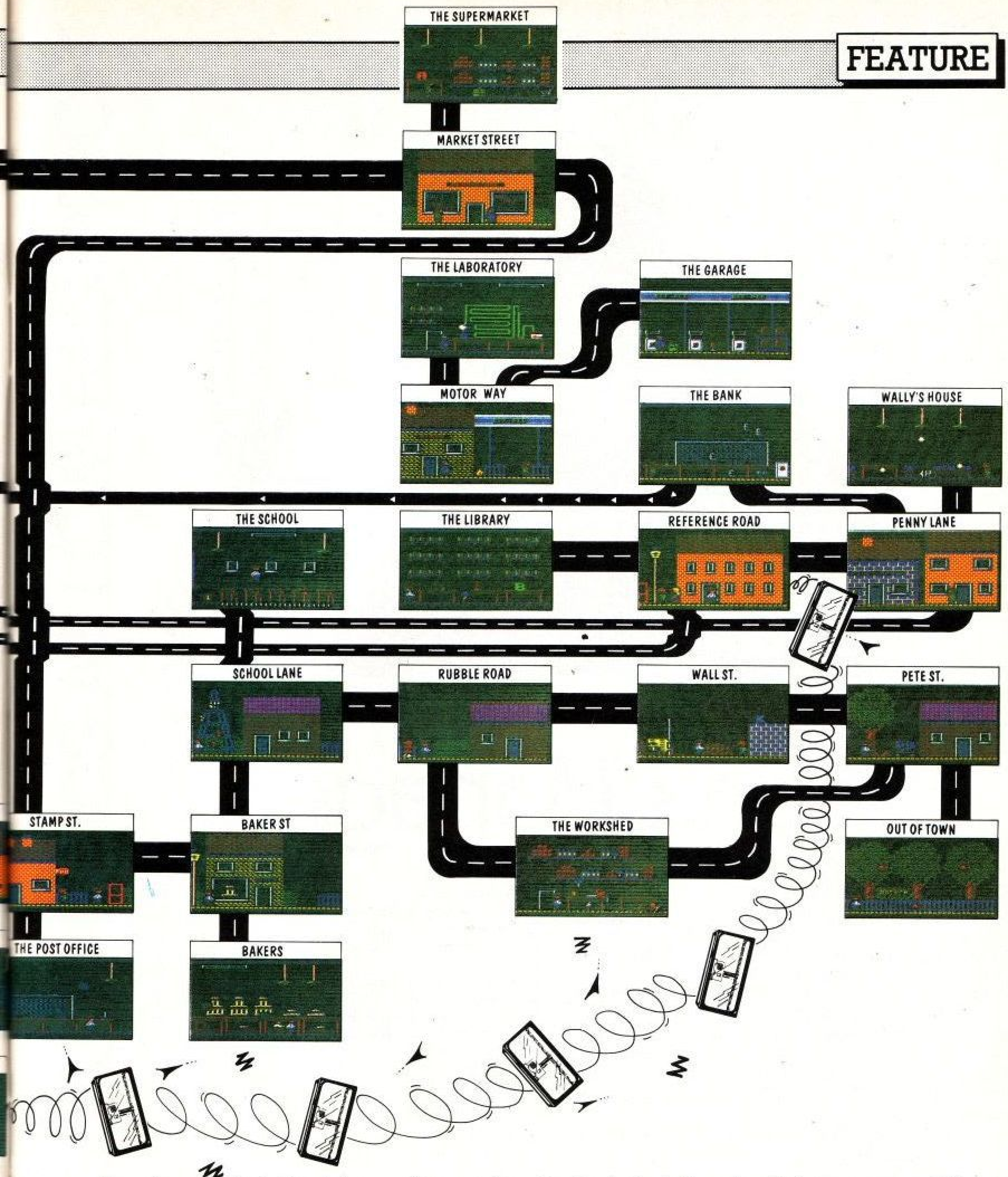


Wally has finally woken up from the nightmare he experienced in 'PYJAMARAMA'. However, now that he has finally got to work, he has discovered that his troubles have only just started. He and the rest of his gang have a lot of work to do around the town, and you have got to help them. As if they didn't have enough problems.

The graphics are even better than Sorcery with outline masks and different sprites having priority over each other. Wally, of course, has the highest priority. The programmers really have had to try hard to cram all the code in. The screen has not only been shrunk to make it easier to program but also to use the rest of the screen you don't see in order to store more data. The technique that allows the graphics to look so good is to have a separate background screen stored elsewhere in memory. Do all the work on that and then move all the data that has changed to the normal screen where you can see it.

To allow you to enjoy the game to the full, I have written a small program to give you infinite endurance, and now follows a few tips on how to complete a few of the tasks. If you don't want to cheat then don't look, and don't think that infinite endurance will spoil the game as it will still take you a long time to complete. The tips are assuming you have not used the program for infinite endurance.

The first task you must do is repair the fountain. Get Dick to go to the bakers to get



the monkey nuts and take them to the zoo and swap them for the monkey wrench. You will have to be quick as Wilma has a tendency to steal the nuts before you get there.Then get the plunger from the Post Office (if someone hasn't beaten you to it) and take them both to the fountain, and voilã, it flows again. You can now get Wally to take the bucket and fill it by walking past the fountain, if you now fetch the sand you can walk past the cement to pick it up. Take the trowel and walk past the wall to build it.

You now need to work out how to get on to it. Well, you need to recharge the battery in the forklift truck so it will raise you up to the letter, and to do that you need to complete the next task.

Next, to allow you to fix the insulator at the top of the pylon, you need the screwdriver which starts off in the station, and the good insulator but, before you can fix it, you must go into the telephone box and shoot the sparks until you hear a beep and then you will find the sparks at the pylon will give you more room and allow you fix it. I will leave it to you to work out how to get the letter.

A few hints; you need the oil to start the trolley in the supermarket; the chewing gum and patch to repair the pipe, and the superglue to mend the hook.

```
10 MEMORY &1FFF:LOAD"
20 FOR n=8557 TO 8564:READ a:POKE n,a:NEXT
30 POKE 8239,109:POKE 8240,2:POKE 8203,117
40 CALL &2000
50 DATA 62,182,50,225,129,195,0,3
```



Bank Manager

With every CPC6128 there is a disc which allows you to get the most out of the extra 64K of RAM. The program on this disc is called the bank manager, since it allows you to manage the extra bank of ram, clever huh? Roland Perry explains how you can make the most of this utility.

This program is the loader program for the BANK MANAGER RSXs described in the CPC6128 User Instructions. Normally the RSXs would be loaded once, when the computer is first switched on (and after every reset). The loader is published here so that interested parties may incorporate it in their software, particularly when writing turnkey packages.

Note that the loader automatically detects if the RSX has been loaded already, and also makes some effort to leave the SYMBOL AFTER state as hygienic as possible. The small assembler program calls the Firmware Entry KL PROBE ROM in order to check that the machine is a 6128 (rather than 464 or 664).

Obviously, the file BANKMAN.BIN must be present on the disc.

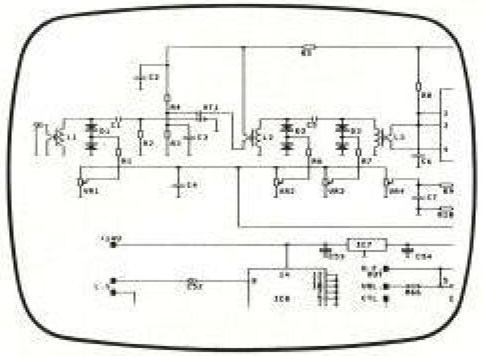
```
10 ON BREAK CONT
20 ON ERROR GOTO 240
30 |BANKOPEN,0:END
40 ON ERROR GOTO 270
50 sa=0:SYMBOL AFTER 256
60 ON ERROR GOTO 0
70 mcentry=HIMEM-15:MEMORY mcentry-1
80 FOR p=mcentry TO mcentry+15
90 READ p$:POKE p,VAL("&"+p$)
100 NEXT
110 a%=0:CALL mcentry,@a%
120 MEMORY mcentry+15
130 version=(a%\256)+256*(a%MOD 256)
140 IF version<&102 THEN 320
150 mcentry=HIMEM-&524
160 ON ERROR GOTO 290
170 IF mcentry<=&7FFF THEN ERROR 7
180 MEMORY mcentry-1:LOAD "bankman.bin",mcentry
190 CALL mcentry
200 |BANKOPEN,0
210 IF sa=0 THEN SYMBOL AFTER 240
220 END
230 DATA E,FF,CD,15,B9,EB,DD,66,1,DD,6E,0,73,23,72,C9
240 ' first lankopen error
250 IF ERR=28 AND ERL=30 THEN RESUME 40
260 GOTO 320
270 ' catch bad SYMBOL AFTER command
280 sa=1:RESUME NEXT
290 ' error in main program
300 CLOSEIN:MEMORY mcentry+&524
310 IF sa=0 THEN SYMBOL AFTER 240
320 PRINT "Load Failed"
330 END
```

ACU

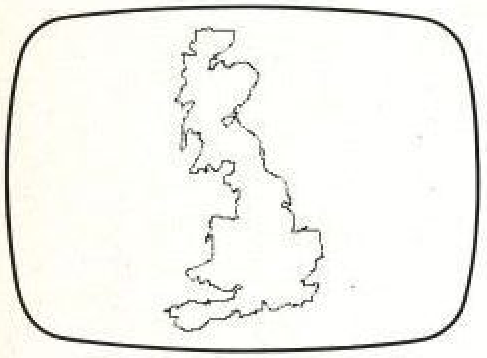
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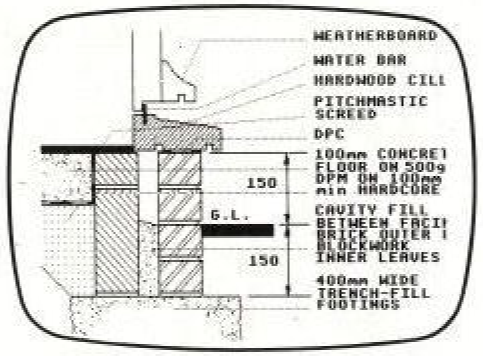
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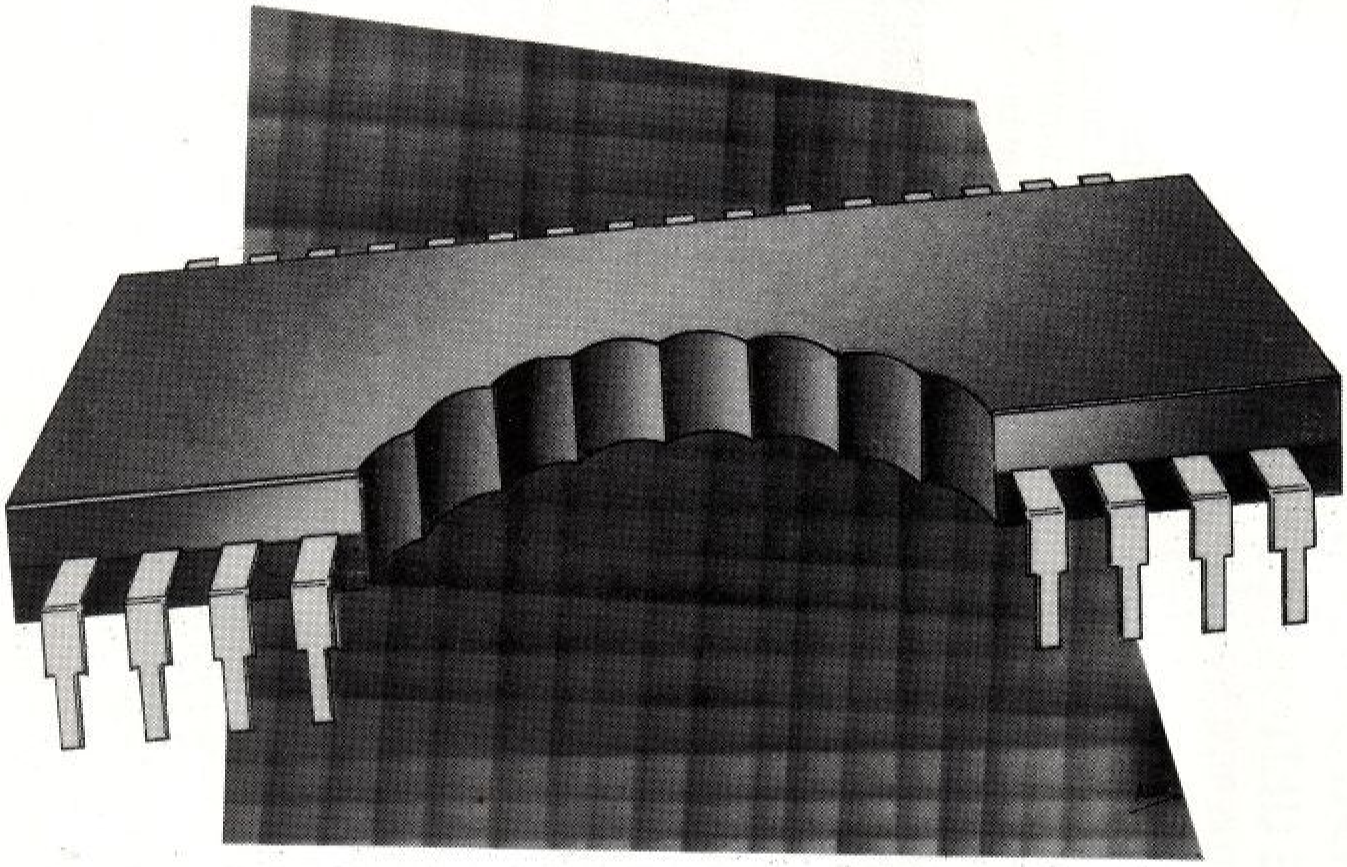
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AMU1

FIRST BYTE

AT



MACHINE CODE

PART 2

In this second article I shall delve deeper into the delights of machine code (m/c) programming by introducing the register pair and performing some simple arithmetic, which is perhaps not as simple as it may first appear.

If you were with me last month you will remember the way we enter a m/c program: exit it, and mess about for a bit in between -with the help of the RET, CALL and LD opcodes. I also introduced the idea of a register - a kind of m/c variable, and highlighted the restrictions imposed by such entities. These restrictions will become more apparent this month and I will show you how the Z80 itself can help get over them.

So onto the register pair. If you recall, each of the seven registers can store a number in the range 0 to 255, and this is by virtue of only 8 bits designated to store the value. If a number is stored in 16 bits, however, the range is 0 to 65535 -much better you'll agree -but how can we store such a number? The answer is to bind together two single registers to form what is called a register pair. Together, there are now 16 bits to store a number. The registers making up the pair can also act on their own, making the system very flexible. This is similar to the way an address is stored in the computer's memory. This means that you can think of the number in two parts. You cannot just bind together any two registers though, in the way you cannot just pick and choose any old letter as the name of a register, and the system works like this:-

H and L form HL
B and C form BC
D and E form DE
A is left on it's own.

Perhaps you can now see why H and L are referred to as High and Low. H takes on the value H*256 when paired with L, and L remains the same value ie. HL=H*256+L, BC=B*256+C etc. A is left on it's own because it is more widely used in this form. It doesn't need a 'partner'. (Well, that isn't strictly true but I'll come to that later). It's job is to manipulate 8 bit numbers not 16-bit. If you are thinking ahead, you'll be wondering if we can manipulate pairs as easily as singles -unfortunately not, but the basic instructions are there. Figure 1 gives the hex-codes for LDing a pair with a number. Don't forget, when coding a 16-bit number you first have to split it into two two-digit hex pairs and transpose the pairs, as with a CALL command. As an example, consider the BASIC statement LET HL=501. The opcode for this would be

```
LD HL,501
```

The hex-code for 'LD HL,' is 21, so this is the first byte of the instruction. The Z80 is now awaiting two more bytes specifying a 16-bit number, with the low byte first. 501 in hex is 01F5, so the hex-code for LD HL,501 is

```
21F501
```

L takes on the value F5, H the value 01 and HL the value 01F5. We can treat the three as seperate variables, until we change one of them, ie. if L became CC, then HL changes to 01CC etc.

Note that there is no way to load from one register pair to another directly, so LD

HL,DE is just not on. This can be emulated though, quite simply, by

```
LD H,D
LD L,E
```

There are, as usual, exceptions to the rule, but they need not concern us as yet. So now we can store numbers in the range 0-255 or 0-65535, but we can't do much to them. That is up until now. It's time to explore the simple arithmetic within the Z80 chip, and what can be simpler than adding 1 to a number. There is a special opcode reserved for this function, and it's name is INC (stands for increment), so for example INC B means B=B+1, and INC DE emulates DE=DE+1; yes, it can be used just as well for register pairs. Figure 2 gives the hexcodes for this operation. Now what do you suppose would happen if A had the value 255 and we perform INC A. Would the computer crash? No it wouldn't: A would simply return to zero to start again upwards. This is the result of what is called an overflow. The A register cannot hold a number greater than 255 and so it overflows, 'spilling' some of it's contents, and what is left happens to be zero. This is similar to a mileage clock. The same happens with a register pair, but it is allowed to go up to 65535 before returning to zero; all very neat and tidy.

The mnemonic DEC, which stands for decrement, has the opposite effect of INC and will subtract one from a register pair or register: the hex-codes are shown in Figure 2. Performing DEC A when A is zero will return A to 255, the exact opposite of INC.

INC and DEC don't leave us much room for manoeuvre. What if we wish to add the contents of one register to another, or perhaps add 1000 to a register pair (a daunting task with INC)? Well, we have been supplied with the ADD command to help us with this. An example of it's use would be ADD HL,BC which has the desired effect LET HL=HL+BC. Unfortunately, it is only possible to add registers to A and register pairs to HL. It is even worse for adding constants - you can only add a constant, eg. 25, to the A register. So to add 1000 to BC, for example, you will need a program something like this.

```
LD H,B
LD L,C
LD BC,03E8
ADD HL,BC
LD B,H
LD C,L
RET
```

A bit messy, you will agree, and it has the undesired effect of using two of the three register pairs, which may be needed for some other task. There is a far better way of achieving this result, but before you find out how, it is necessary to discuss what happens when an overflow is incurred with the ADD instruction.

Consider adding 3F to EC, the current value of A, using the instruction ADD A,3F. We can represent the addition by showing what happens to the individual bits of the bytes.

```
3F       11101100
EC       00111111
        ---------
        1 00101011
        ---------
```

We end up with A becoming 00101011 and we have an overflow of 1, the part that has 'spilled' out of the register. Unlike INC and DEC, this bit or CARRY (as it is known) is not lost forever, but is stored someplace to show that an overflow has occured so that measures can be taken into account for the overflow. Note that whatever the previous value of a carry was, when an ADD instruction is carried out, the carry is replaced by a new value from the latest ADD, be it 0 or 1. The place where the carry is stored is called the CARRY FLAG, or C for short (not to be confused with the register C). A flag is a curious word to use here, but it can be thought of as a kind of simple message carrier. In the old days, before telephone, the quickest way to send a message was for the receiver to look across to the next hill for the current state of a flag - up or down, and action was taken accordingly. It isn't too different when considering the carry flag, but you must remember to 'look' at the flag, and of course this must be done with the aid of an opcode. The flag is either 1 (on or set) or 0 (off or reset). I shall refer to flags as being set or reset.

There are a whole host of opcodes featuring the carry flag, and I shall just discuss two for now. The first is ADC (add with carry), and it works like this.

```
ADC A,B means

LET A=A+B+carry
LET carry=( A+B+carry ) MOD 256
```

whereas

```
ADD A,B means

LET A=A+B
LET carry=( A+B ) MOD 256
```

In other words, ADC takes into account the carry and adds it to the final result, and then changes the flag. ADD just changes the carry after the addition, not caring about the previous value of the carry. Look at the next program. What does it do?

```
LD A,C
ADD A,E8
LD C,A
LD A,B
ADC A,03
LD B,A
RET
```

This routine performs the same task as the program above, ie. add 1000 to BC, but this time only the A register is called into play, instead of HL. Note the way the instruction ADC A,03 is used to carry over any overflow that occured when E8 was added to C. The codes for the ADD and ADC instructions are given in Figure 3. As with ADD, you can only ADC to A or HL. Another way to utilise the carry flag is to treat it as a condition. If the carry flag is set, do one thing otherwise do something different. Two instructions which use this idea are 'RET C' and 'RET NC'. The RET you have met before, meaning return to BASIC or return from a m/c subroutine. RET C has the same effect as RET when executed, but it is only executed when the carry flag is set, ie.

```
RET C means IF CARRY=1 then RET
RET NC means IF CARRY=0 then RET
ie. No Carry
```

Before I combine some of the instructions you have met this month into a program , I shall just introduce one more instruction -JP (meaning JUMP). It is very similar to the GOTO instruction in BASIC, except you specify the absolute (non-relative) address of the start of the m/c instruction you wish to be executed next instead of the line number of the program step. For example,

```
JP 71EF means execute next the instruction at &71EF
```

To round things off, I shall just say that there is such an instruction as JP C, (jump only if carry set) and JP NC, (jump only if carry reset). There is also CALL C, and CALL NC.

Here is a resonably small program for you to type in using HEXLD, the m/c loader program I gave you last month. Just to refresh your memory, HEXLD takes hex-code and loads it into a position in memory specified by you, to be run as a m/c subroutine. The loader cannot handle opcodes, just hex-code. The program given below simulates a small typewriter, which will prepare one page of text of 32 columns and 24 lines. The simulation is very crude

```
7000   0E00           LD C,0
7002   0600     L2    LD B,0
7004   CD18BB   L1    CALL KMWAIT   ;Call address &BB18
7007   CD5ABB         CALL PRINT
700A   D60E           SUB 14        ;Subtract 14 form A to test
700C   DA1B70         JP C,L3       ;whether a CHR of less than
700F   78             LD A,B        ;14 has been printed ie. ENTER
7010   C608           ADD A,8       ;been pressed.
7012   47             LD B,A
7013   D20470         JP NC,L1      ;If A has overflowed then
7016   3E0D           LD A,13       ;print CHR(13) then CHR(10)
7018   CD5ABB         CALL PRINT    ;to Îcarriage return' else
701B   3E0A     L3    LD A,10       ;goto L1
701D   CD5ABB         CALL PRINT
7020   79             LD A,C
7021   C60B           ADD A,11
7023   4F             LD C,A
7024   D20270         JP NC,L2      ;If C overflowed then 25th line
7027   C9             RET           ;has been reached so RET
```

and delete has not been supplied - just like a real typewriter.

There are quite a few things in the above program that need an explanation. Just to refresh your memory, the first column is the address of the start of the m/c instruction on that line. The second column is the hex-code, the part you type into HEXLD. The fourth column is the opcode and the fifth is a remark column. The third column you will not have met before. This is the LABEL column, and the idea is to label various instructions with a name, in this case the names are simply L1, L2 and L3. We can now refer to these instructions by their name in an opcode. So JP NC,L2 means Jump to instruction L2, which is situated at address &7002. The absolute address has to be inserted into the hex-code, of course, and the purpose of the labels is to assist the human who may be lost without line references. It isn't neccessary to label every line, so line numbers are ommited.

KMWAIT and PRINT are the names given to two ROM subroutines, one of which you met last month (PRINT). Within the ROM (the computers own memory) are small m/c subroutines which perform a specific task. The name is an indication of that task. PRINT takes the value of the A register and puts onto the screen the character whose code is A. KMWAIT is a little more complicated. Once called, the routine takes one character from the keyboard buffer and stores it's value in A. If there is no character in the buffer then it waits until a key is pressed. CALL KMWAIT followed by CALL PRINT therefore puts the key you press onto the screen. CHR(13) and CHR(10) have the effect of the ENTER key. A new instruction which I have abruptly brought into the program is SUB and takes the form SUB r or SUB n where r is a register and n is a single byte number. It has the effect LET A=A−r or LET A=A−n. The operation only works for the A register.

Later I shall be looking at how to PEEK and POKE in m/c and the strange workings of the STACK. The flag register will also slowly be unveiled. Just to give you something to do between now and then, try to write a program which will subtract one form the C register (without using DEC or SUB) until C reaches 0. Then RET. Answers next month. Happy Coding.

FIGURE 1

Hex-codes for LD s,nn (s is a register pair)

OPCODE	HEX
LD BC,	01
LD DE,	11
LD HL,	21

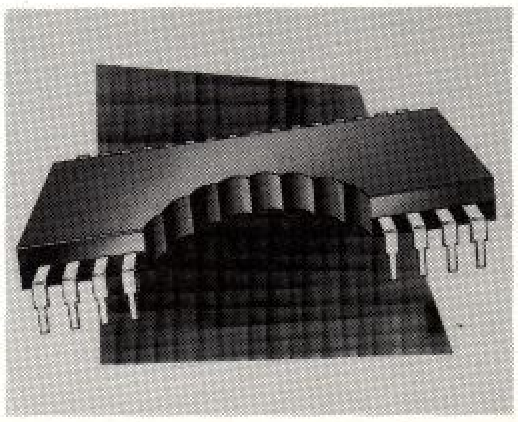


FIGURE 2

The hex-codes for INC and DEC

OPCODE	HEX	OPCODE	HEX
INC BC	03	DEC BC	0B
INC DE	13	DEC DE	1B
INC HL	23	DEC HL	2B
INC A	3C	DEC A	3D
INC B	04	DEC B	05
INC C	0C	DEC C	0D
INC D	14	DEC D	15
INC E	1C	DEC E	1D
INC H	24	DEC H	25
INC L	2C	DEC L	2D

FIGURE 3

Hex-codes for ADD and ADC

OPCODE	HEX	OPCODE	HEX
ADD HL,BC	09	ADC HL,BC	ED4A
ADD HL,DE	19	ADC HL,DE	ED5A
ADD HL,HL	29	ADC HL,HL	ED6A
ADD A,A	87	ADC A,A	8F
ADD A,B	80	ADC A,B	88
ADD A,C	81	ADC A,C	89
ADD A,D	82	ADC A,D	8A
ADD A,E	83	ADC A,E	8B
ADD A,H	84	ADC A,H	8C
ADD A,L	85	ADC A,L	8D
ADD A,n	C6	ADC A,n	CE

ACU


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SPLATCH!

Hello all you tired-fingered people. Just as you recover from last month's epic typing session it is time to enter the rest of our prize winning listing. If you have given up and want to buy the program on tape or disc from Garwood (see page 16) the whole lot is on tape 12.

You should have eight tapes labelled 1 to 7 and 'combination'. The first two tapes contain the programs you slaved over last month. Type in the remaining five programs and save them to tapes 3,4,5,6 and 7. Remember to keep frequent back-up copies. When you have all the programs working individually it is time to amalgamate them.

Load program 1. Put the 'combination' tape in and type SAVE 'PROGRAM1'. Do not rewind the tape. Swap tapes and load program 2. Put the 'combination' tape in and type SAVE 'PROGRAM2'. Do not rewind the tape. Swap tapes and load program 3. Put the 'combination' tape in and type SAVE 'PROGRAM3'. Do not rewind the tape. Swap tapes and load program 4. Put the 'combination' tape in and type SAVE 'PROGRAM4'. Do not rewind the tape. Swap tapes and load program 5. Put the 'combination' tape in and type SAVE 'PROGRAM5'. Do not rewind the tape. Swap tapes and load program 6. Put the 'combination' tape in and type SAVE 'PROGRAM6'. Do not rewind the tape. Swap tapes and load program 7. Put the 'combination' tape in and type SAVE 'PROGRAM7'. Now rewind the combination tape.

Time for the moment of truth. Reset the computer and press CTRL and the small Enter key. The programs will (or rather should) load in order, each one tucking the machine code away into memory. This takes ages so go and make a cup of tea (two lumps for me please - Ed.). When you get back you will either see an error message on the screen, which will mean that you have made a mistake typing the program in. In which case you should type in PRINT ln. The number you get back will tell you which line the mistake is in or near. Or you will see the word 'SPLATCH' on the screen rolling around in glorious machine code. You may find that the program is still loading, time to drink your tea, and read some of the other articles in this magazine.

Once the whole thing is working get ready for the best game ever printed in a computer magazine.

Program 3

```
5 REM listing3
6 PRINT"Program 3 is running":PRINT"Work
  ing on line"
10 valid$="0123456789ABCDEF":ln=8000
20 x=26360
30 FOR y=0 TO 7
40 READ num$:IF num$="***" THEN 110
50 IF INSTR(valid$,LEFT$(num$,1)) OR INS
   TR (valid$,RIGHT$(num$,1)) THEN num=V
   AL("&"+num$):POKE x+y,num ELSE 120
60 chk=chk+num
70 NEXT:ln=ln+10
80 READ check:IF chk<>check THEN 130
90 chk=0
95 PRINT ln;CHR$(11)
100 x=x+8:GOTO 30
110 PRINT"bytes=";x+y
115 RUN"program4
120 PRINT"Invalid character in line ";ln
    :END
130 PRINT"Checksum error in line ";ln:EN
    D
8000 DATA 0D,59,CD,28,5C,CD,AE,62,916
8010 DATA 3A,96,5A,EE,01,32,96,5A,827
8020 DATA AF,32,89,5A,CD,09,BB,C1,1046
8030 DATA D8,10,E0,3A,84,58,3C,FE,1048
8040 DATA 1A,C8,32,84,58,C3,B9,66,978
8050 DATA 3E,01,CD,0E,BC,21,36,68,661
8060 DATA CD,1D,5C,CD,06,BB,FE,0D,991
8070 DATA C8,C3,2B,67,3E,01,CD,0E,823
8080 DATA BC,CD,D6,62,21,F1,69,CD,1289
8090 DATA 1D,5C,CD,AE,62,C9,20,20,863
8100 DATA 20,20,20,20,20,20,20,20,256
8110 DATA 20,20,20,20,20,20,20,20,256
8120 DATA 20,20,20,20,20,20,20,20,256
8130 DATA 20,20,20,20,20,20,20,20,256
8140 DATA 20,20,20,20,20,20,20,20,256
8150 DATA 20,20,20,20,20,20,20,20,256
8160 DATA 20,20,20,20,20,20,53,50,355
8170 DATA 4C,41,54,43,48,21,20,20,461
8180 DATA 20,20,20,20,20,20,20,20,256
8190 DATA 20,20,20,20,20,20,20,20,256
8200 DATA 20,20,20,20,20,20,20,20,256
8210 DATA 20,20,20,20,20,20,5F,5F,382
8220 DATA 5F,5F,5F,5F,5F,5F,20,20,634
8230 DATA 20,20,20,20,20,20,20,20,256
8240 DATA 20,20,20,20,20,20,20,20,256
8250 DATA 20,20,20,20,20,20,20,20,256
8260 DATA 20,20,20,20,20,20,20,20,256
8270 DATA 20,20,20,20,20,20,20,20,256
8280 DATA 20,20,20,20,20,20,20,20,256
8290 DATA 20,20,20,20,20,20,20,20,256
8300 DATA 20,20,20,20,20,20,20,20,256
8310 DATA 20,20,20,20,20,20,20,20,256
8320 DATA 20,20,20,20,20,20,20,20,256
8330 DATA 20,20,20,20,20,20,20,20,256
8340 DATA 20,20,20,20,20,20,20,20,256
8350 DATA 20,20,20,20,20,20,20,20,256
8360 DATA 20,20,20,50,55,53,48,20,448
8370 DATA 41,4E,59,20,4B,45,59,20,529
8380 DATA 20,20,20,20,20,20,20,20,256
8390 DATA 20,20,20,20,20,20,21,21,258
8400 DATA 21,21,21,21,21,21,21,21,264
8410 DATA 21,43,4F,4E,47,52,41,54,559
8420 DATA 55,4C,41,54,49,4F,4E,53,623
8430 DATA 21,21,21,21,21,21,21,21,264
8440 DATA 21,21,21,21,21,21,20,20,262
8450 DATA 20,20,20,20,20,20,20,20,256
8460 DATA 20,5F,5F,5F,5F,5F,5F,5F,697
8470 DATA 5F,5F,5F,5F,5F,5F,5F,5F,760
8480 DATA 20,20,20,20,20,20,20,20,256
8490 DATA 20,20,20,20,20,20,20,20,256
8500 DATA 20,20,20,20,20,20,20,20,256
8510 DATA 20,20,20,20,20,20,20,20,256
8520 DATA 20,20,20,20,20,20,20,20,256
8530 DATA 20,20,20,20,20,20,20,20,256
8540 DATA 20,20,20,20,20,20,20,20,256
8550 DATA 59,6F,75,20,68,61,76,65,769
8560 DATA 20,63,6F,6D,70,6C,65,74,788
8570 DATA 65,64,20,53,50,4C,41,54,621
8580 DATA 43,48,21,2C,59,6F,75,20,565
8590 DATA 68,61,76,65,20,20,63,6F,694
8600 DATA 6D,70,6C,65,74,65,64,20,779
8610 DATA 74,68,65,20,75,6C,74,69,799
8620 DATA 6D,61,74,65,20,74,65,73,787
8630 DATA 74,20,6F,66,20,72,65,66,710
8640 DATA 6C,65,78,73,2C,20,63,6F,730
8650 DATA 6F,72,64,69,6E,61,74,69,858
8660 DATA 6F,6E,20,61,6E,64,20,42,658
8670 DATA 4C,41,48,20,42,4C,41,48,524
8680 DATA 20,42,4C,41,48,21,21,21,410
8690 DATA 21,21,21,21,21,21,20,20,262
8700 DATA 52,69,6E,67,20,30,34,32,582
8710 DATA 31,35,20,33,30,38,33,20,372
8720 DATA 61,6E,64,20,61,73,6B,20,690
8730 DATA 66,6F,72,20,52,4F,42,4F,665
8740 DATA 21,20,20,20,20,20,20,20,257
8750 DATA 4C,6F,6F,6B,20,6F,75,74,781
8760 DATA 20,66,6F,72,20,52,6F,62,682
8770 DATA 6F,73,6F,66,74,20,6E,65,798
8780 DATA 78,74,20,67,72,65,61,74,799
8790 DATA 20,67,61,6D,65,2C,20,57,605
8800 DATA 69,6C,64,20,77,65,73,74,796
8810 DATA 20,65,6E,63,6F,75,6E,74,796
8820 DATA 65,72,28,69,6E,20,33,44,621
8830 DATA 2C,6E,6F,20,6C,65,73,73,736
8840 DATA 29,2E,20,20,20,20,20,20,279
8850 DATA 20,20,20,20,20,20,20,20,256
8860 DATA 20,20,20,20,20,20,20,20,256
8870 DATA 20,20,20,20,20,20,20,20,256
8880 DATA 20,20,20,20,20,20,20,20,256
8890 DATA 20,20,20,20,20,20,20,20,256
8900 DATA 20,20,20,20,20,20,20,50,304
8910 DATA 55,53,48,20,45,4E,54,45,572
8920 DATA 52,20,54,4F,20,43,4F,4E,533
8930 DATA 54,49,4E,55,45,20,20,20,485
8940 DATA 20,20,20,20,20,20,FF,FF,702
8950 DATA FF,20,20,20,20,20,20,20,479
8960 DATA 20,20,20,20,20,20,20,20,256
8970 DATA 20,43,52,45,44,49,54,53,558
8980 DATA 20,20,20,20,20,20,20,20,256
8990 DATA 20,20,20,20,20,20,20,20,256
9000 DATA 20,20,20,20,20,20,20,20,256
9010 DATA 20,20,20,20,20,20,20,20,256
9020 DATA 20,5F,5F,5F,5F,5F,5F,5F,697
9030 DATA 20,20,20,20,20,20,20,20,256
9040 DATA 20,20,20,20,20,20,20,20,256
9050 DATA 20,20,50,52,4F,47,52,41,523
9060 DATA 4D,20,43,4F,44,45,20,41,489
9070 DATA 4E,44,20,44,45,53,49,47,542
9080 DATA 4E,3A,20,52,4F,42,4F,20,506
9090 DATA 20,20,20,20,20,20,20,20,256
```

```
9100 DATA 20,20,4D,55,53,49,43,20,481
9110 DATA 41,44,56,49,43,45,20,41,525
9120 DATA 4E,44,20,43,4F,4D,50,4F,560
9130 DATA 53,49,54,49,4F,4E,20,3A,560
9140 DATA 20,42,4F,57,52,41,4E,53,572
9150 DATA 20,20,41,52,54,57,4F,52,543
9160 DATA 4B,20,4F,4E,20,50,41,50,521
9170 DATA 45,52,20,3A,20,43,4C,41,481
9180 DATA 59,44,45,4E,20,20,20,20,432
9190 DATA 20,20,20,20,20,20,20,20,256
9200 DATA 20,20,57,41,4C,4C,59,20,489
9210 DATA 48,45,4C,50,46,55,4C,20,560
9220 DATA 43,4F,4D,4D,45,4E,54,53,614
9230 DATA 20,3A,20,47,41,56,49,4E,495
9240 DATA 2B,50,4F,50,45,20,20,20,447
9250 DATA 20,20,20,20,20,20,20,20,256
9260 DATA 20,20,20,20,20,20,20,20,256
9270 DATA 20,20,20,20,20,20,20,20,256
9280 DATA 20,20,20,20,20,20,20,20,256
9290 DATA 20,20,20,20,20,20,20,20,256
9300 DATA 20,20,54,48,49,53,20,50,488
9310 DATA 52,4F,47,52,41,4D,20,49,561
9320 DATA 53,20,42,52,4F,55,47,48,570
9330 DATA 54,20,54,4F,20,59,4F,55,564
9340 DATA 20,46,52,4F,4D,20,20,20,436
9350 DATA 20,52,4F,42,4F,53,4F,46,570
9360 DATA 54,2E,57,52,49,54,54,45,609
9370 DATA 4E,20,49,4E,20,41,20,53,473
9380 DATA 45,43,52,45,54,20,4E,55,566
9390 DATA 43,4C,45,41,52,20,20,20,455
9400 DATA 20,42,55,4E,4B,45,52,2C,531
9410 DATA 53,4F,4D,45,57,48,45,52,618
9420 DATA 45,20,49,4E,20,52,4F,42,511
9430 DATA 4F,27,53,20,42,45,44,52,518
9440 DATA 4F,4F,4D,2E,49,54,20,20,502
9450 DATA 20,54,48,4F,55,53,41,4E,578
9460 DATA 44,53,20,4F,46,20,41,50,509
9470 DATA 50,4C,45,53,2C,53,41,52,582
9480 DATA 4E,49,4E,45,53,20,41,4E,556
9490 DATA 44,20,42,4F,4F,5A,45,20,515
9500 DATA 20,54,4F,20,50,45,52,46,528
9510 DATA 45,43,54,2E,53,50,45,43,565
9520 DATA 49,41,4C,20,54,48,41,4E,545
9530 DATA 4B,53,20,54,4F,20,50,45,534
9540 DATA 54,45,20,54,48,45,20,20,474
9550 DATA 20,50,52,4F,47,52,41,4D,568
9560 DATA 49,4E,47,20,50,49,44,47,546
9570 DATA 45,4F,4E,2C,41,4E,44,20,513
9580 DATA 4E,4F,20,54,48,41,4E,4B,563
9590 DATA 53,20,54,4F,20,4D,55,4D,549
9600 DATA 2B,44,41,44,21,21,21,21,376
9610 DATA 2E,20,20,20,20,20,20,20,270
9620 DATA 20,20,20,20,20,20,20,20,256
9630 DATA 20,20,20,20,20,20,20,20,256
9640 DATA 20,20,20,20,20,20,20,20,256
9650 DATA 20,FF,FF,00,01,01,02,03,549
9660 DATA 03,04,04,05,06,06,07,07,42
9670 DATA 08,09,09,0A,0A,0B,0C,0C,81
9680 DATA 0D,0E,0F,0F,10,10,11,12,124
9690 DATA 12,13,14,14,15,15,16,17,164
9700 DATA 17,18,19,14,14,14,0E,0F,161
9710 DATA 0F,10,10,11,12,12,13,14,139
9720 DATA 14,14,01,00,BC,3E,01,ED,529
9730 DATA 79,04,3D,ED,79,01,12,12,581
9740 DATA 01,00,00,CD,38,BC,CD,93,802
9750 DATA BB,5F,CD,99,BB,57,D5,3E,1189
9760 DATA 02,CD,96,BB,3E,0C,CD,5A,913
9770 DATA BB,11,D7,6C,01,E8,03,1A,789
9780 DATA A7,CA,CA,6C,FE,FF,CA,9B,1545
9790 DATA 6C,CD,5A,BB,13,0B,78,B1,917
9800 DATA C2,87,6C,D1,7B,CD,90,BB,1305
9810 DATA 7A,CD,96,BB,3E,01,21,23,795
9820 DATA 6C,01,00,BC,CD,19,BD,CD,921
9830 DATA 19,BD,1E,01,ED,59,04,ED,812
9840 DATA 79,1E,06,05,ED,59,5E,04,586
9850 DATA ED,59,3C,23,FE,29,C2,A9,1079
9860 DATA 6C,C9,13,1A,CD,90,BB,13,909
9870 DATA 1A,CD,96,BB,C3,94,6C,00,1019
9880 DATA 00,01,0D,0A,0A,20,20,20,130
9890 DATA 20,20,20,20,20,20,20,20,256
9900 DATA 8F,8F,D7,20,8F,20,20,20,772
9910 DATA D6,8F,D7,20,8F,20,8F,20,954
9920 DATA 20,8F,20,20,20,20,20,20,367
9930 DATA 20,20,20,20,20,20,20,20,256
9940 DATA 20,20,20,20,20,20,20,20,256
9950 DATA 8F,20,8F,20,8F,20,20,20,589
9960 DATA 8F,20,8F,20,D5,8F,D4,20,950
9970 DATA 20,8F,20,20,20,20,20,20,367
9980 DATA 20,20,20,20,20,20,20,20,256
9990 DATA 20,20,20,20,20,20,20,20,256
10000 DATA 8F,8F,D4,20,8F,20,20,20,769
10010 DATA 8F,8F,8F,20,20,8F,20,20,700
10020 DATA 20,20,20,20,20,20,20,20,256
10030 DATA 20,20,20,20,20,20,20,20,256
10040 DATA 20,20,20,20,20,20,20,20,256
10050 DATA 8F,20,20,20,D5,8F,8F,20,770
10060 DATA 8F,20,8F,20,20,8F,20,20,589
10070 DATA 20,CA,20,20,20,20,20,20,426
10080 DATA 20,20,20,20,20,0D,0A,0A,193
10090 DATA 00,02,03,20,20,20,D6,8F,458
10100 DATA D7,20,8F,8F,D7,20,8F,20,955
10110 DATA 20,20,D6,8F,D7,20,D6,8F,1025
10120 DATA 8F,8F,D7,20,D6,8F,D7,20,1137
10130 DATA 8F,20,8F,20,20,D6,8F,D7,954
10140 DATA 20,20,20,20,20,20,8F,20,367
10150 DATA 20,20,8F,20,8F,20,8F,20,589
10160 DATA 20,20,8F,20,8F,20,20,20,478
10170 DATA 8F,20,20,20,8F,20,20,20,478
10180 DATA 8F,20,8F,20,20,8F,8F,8F,811
10190 DATA 20,20,20,20,20,20,8F,20,367
10200 DATA 20,20,8F,20,8F,20,8F,20,589
10210 DATA 20,20,8F,20,8F,20,20,20,478
10220 DATA 8F,20,20,20,8F,20,20,20,478
10230 DATA 8F,20,8F,20,20,8F,8F,8F,811
10240 DATA 20,20,20,20,20,20,D5,8F,548
10250 DATA D7,20,8F,8F,D4,20,8F,20,952
10260 DATA 20,20,8F,8F,8F,20,20,20,589
10270 DATA 8F,20,20,20,8F,20,20,20,478
10280 DATA 8F,8F,8F,20,20,8F,8F,8F,922
10290 DATA 20,20,20,20,20,20,20,20,256
10300 DATA 8F,20,8F,20,20,20,8F,20,589
10310 DATA 20,20,8F,20,8F,20,20,20,478
10320 DATA 8F,20,20,20,8F,20,20,20,478
10330 DATA 8F,20,8F,20,20,D5,8F,D4,950
10340 DATA 20,20,20,20,20,20,20,20,256
10350 DATA 8F,20,8F,20,20,20,8F,20,589
10360 DATA 20,20,8F,20,8F,20,20,20,478
10370 DATA 8F,20,20,20,8F,20,20,20,478
10380 DATA 8F,20,8F,20,20,20,20,20,478
10390 DATA 20,20,20,20,20,20,D5,8F,548
10400 DATA D4,20,8F,20,20,20,D5,8F,839
10410 DATA 8F,20,8F,20,8F,20,20,20,589
10420 DATA 8F,20,20,20,D5,8F,8F,20,770
10430 DATA 8F,20,8F,20,20,20,8F,20,589
10440 DATA 20,20,20,0D,0A,00,02,01,122
10450 DATA 09,09,09,09,09,09,09,09,72
10460 DATA 09,09,09,09,09,20,20,20,141
10470 DATA 20,20,20,20,20,20,20,20,256
10480 DATA 20,20,20,0A,0D,09,09,09,146
10490 DATA 09,09,09,09,09,09,09,09,72
10500 DATA 09,09,20,42,59,20,52,4F,398
10510 DATA 42,4F,53,4F,46,54,21,20,526
10520 DATA 0A,0D,09,09,09,09,09,09,77
10530 DATA 09,09,09,09,09,09,09,20,95
10540 DATA 20,20,20,20,20,20,20,20,256
10550 DATA 20,20,20,20,20,0A,0D,0A,193
10560 DATA 0D,00,01,00,20,20,20,20,142
10570 DATA 20,20,20,20,20,20,20,20,256
10580 DATA 20,20,20,20,54,48,45,20,385
10590 DATA 20,47,41,4D,45,3A,20,20,436
10600 DATA 20,20,20,20,20,20,20,20,256
10610 DATA 20,20,20,20,20,4F,46,20,341
10620 DATA 57,48,49,43,48,20,38,2F,506
10630 DATA 31,30,20,4F,57,4E,45,52,524
10640 DATA 53,20,46,49,4E,44,20,41,501
10650 DATA 20,43,4F,4D,4D,4F,44,4F,558
10660 DATA 52,45,20,20,20,4C,4F,41,467
10670 DATA 44,49,4E,47,20,53,43,52,554
10680 DATA 45,45,4E,20,4D,4F,52,45,555
10690 DATA 20,53,54,49,4D,55,4C,41,575
10700 DATA 54,49,4E,47,20,41,4E,44,549
10710 DATA 20,4F,46,20,20,57,48,49,477
10720 DATA 43,48,20,54,48,45,20,47,499
10730 DATA 52,45,41,54,20,50,4F,45,560
10740 DATA 54,20,53,54,45,56,45,2E,553
10750 DATA 42,20,28,57,49,54,48,20,486
10760 DATA 41,4E,20,20,20,27,53,27,400
10770 DATA 20,4E,4F,54,20,27,50,48,496
10780 DATA 27,29,20,53,41,49,44,20,433
10790 DATA 27,55,54,54,45,52,20,50,555
10800 DATA 49,46,46,45,4C,21,27,20,462
10810 DATA 20,20,20,20,FF,20,20,20,479
10820 DATA 20,20,8F,8F,8F,20,8F,8F,811
10830 DATA 8F,20,8F,20,20,20,8F,8F,700
10840 DATA 8F,20,8F,8F,8F,20,8F,8F,922
10850 DATA 8F,20,8F,20,8F,20,20,8F,700
10860 DATA 20,20,20,20,20,20,20,20,256
10870 DATA 20,20,8F,20,20,20,8F,20,478
10880 DATA 8F,20,8F,20,20,20,8F,20,589
10890 DATA 8F,20,20,8F,20,20,8F,20,589
10900 DATA 20,20,8F,20,8F,20,20,8F,589
10910 DATA 20,20,20,20,20,20,20,20,256
10920 DATA 20,20,8F,8F,8F,20,8F,8F,811
10930 DATA 8F,20,8F,20,20,20,8F,8F,700
10940 DATA 8F,20,20,8F,20,20,8F,20,589
10950 DATA 20,20,8F,8F,8F,20,20,8F,700
10960 DATA 20,20,20,20,20,20,20,20,256
10970 DATA 20,20,20,20,8F,20,8F,20,478
10980 DATA 20,20,8F,20,20,20,8F,20,478
10990 DATA 8F,20,20,8F,20,20,8F,20,589
11000 DATA 20,20,8F,20,8F,20,20,20,478
11010 DATA 20,20,20,20,20,20,20,20,256
11020 DATA 20,20,8F,8F,8F,20,8F,20,700
11030 DATA 20,20,8F,8F,8F,20,8F,20,700
11040 DATA 8F,20,20,8F,20,20,8F,8F,700
11050 DATA 8F,20,8F,20,8F,20,20,8F,700
11060 DATA 20,20,20,20,20,0A,20,20,234
11070 DATA 20,20,20,20,20,20,20,20,256
11080 DATA 20,20,48,49,47,48,20,53,467
11090 DATA 43,4F,52,45,20,54,41,42,544
11100 DATA 4C,45,20,20,20,20,20,20,337
11110 DATA 20,20,20,20,20,20,20,20,256
11120 DATA 20,20,20,20,20,20,20,20,256
11130 DATA 20,20,5F,5F,5F,5F,5F,5F,634
11140 DATA 5F,5F,5F,5F,5F,5F,5F,5F,760
11150 DATA 5F,5F,20,20,20,20,20,20,382
11160 DATA 20,20,20,20,20,20,54,48,348
11170 DATA 45,20,4D,41,44,20,52,4F,504
11180 DATA 42,4F,2C,54,48,45,20,44,514
11190 DATA 45,4D,45,4E,54,45,44,20,546
11200 DATA 44,57,41,52,46,20,52,49,559
11210 DATA 43,48,41,52,44,20,54,48,542
11220 DATA 45,20,44,45,50,50,52,45,549
11230 DATA 53,53,45,44,20,4F,4E,45,561
11240 DATA 2E,20,20,20,20,20,54,48,362
11250 DATA 45,20,4D,41,44,20,4D,4F,499
11260 DATA 4F,47,2B,53,54,49,4D,55,595
11270 DATA 4C,41,54,49,4E,47,20,53,562
11280 DATA 41,48,52,41,20,20,44,41,481
11290 DATA 56,45,20,50,4F,50,45,2E,541
11300 DATA 2E,2E,2E,20,4E,45,45,44,454
11310 DATA 20,49,20,53,41,59,20,4D,483
11320 DATA 4F,52,45,20,3F,3F,4A,55,547
11330 DATA 53,54,49,4E,20,54,48,45,575
11340 DATA 20,53,4D,4F,4F,54,48,20,538
11350 DATA 44,55,44,45,2C,68,65,20,571
11360 DATA 74,68,69,6E,6B,73,43,4C,800
11370 DATA 41,59,44,45,4E,21,21,21,468
11380 DATA 2C,28,47,4F,20,4F,4E,20,455
11390 DATA 42,45,20,41,20,44,45,56,487
11400 DATA 49,4C,29,20,20,20,41,4E,429
11410 DATA 59,54,48,49,4E,47,20,49,572
11420 DATA 4E,20,41,20,53,4B,49,52,520
11430 DATA 54,20,54,48,41,54,20,4D,530
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11440 DATA 4F,56,45,53,20,20,4D,41,523
11450 DATA 44,44,4F,4E,41,2E,2E,2E,496
11460 DATA 2E,2E,2E,57,57,48,48,48,528
11470 DATA 48,48,48,55,55,55,55,55,641
11480 DATA 55,55,55,21,21,21,00,00,354
11490 DATA 00,00,00,00,00,00,00,00,0
11500 DATA ***
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Program 4

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5 REM program 4
6 PRINT"Program 4 is running":PRINT"Work
  ing on line"
10 valid$="0123456789ABCDEF":ln=11500
20 x=29160
30 FOR y=0 TO 7
40 READ num$:IF num$="***" THEN 110
50 IF INSTR(valid$,LEFT$(num$,1)) OR INS
   TR (valid$,RIGHT$(num$,1)) THEN num=V
   AL("&"+num$):POKE x+y,num ELSE 120
60 chk=chk+num
70 NEXT:ln=ln+10
80 READ check:IF chk<>check THEN 130
90 chk=0
95 PRINT ln;CHR$(11)
100 x=x+8:GOTO 30
110 PRINT"bytes=";x+y
115 RUN"program5
120 PRINT"Invalid character in line ";ln
    :END
130 PRINT"Checksum error in line ";ln:EN
    D
11500 DATA 00,00,00,00,00,00,00,00,0
11510 DATA 00,00,00,00,00,00,00,00,0
11520 DATA 00,00,00,00,00,00,00,00,0
11530 DATA 00,00,00,00,00,00,00,00,0
11540 DATA 00,00,00,00,00,00,00,00,0
11550 DATA 00,00,00,00,00,00,00,00,0
11560 DATA 00,00,00,00,00,00,00,00,0
11570 DATA 00,00,00,00,00,00,00,00,0
11580 DATA 00,00,00,00,00,00,00,00,0
11590 DATA 00,00,00,00,00,00,00,00,0
11600 DATA 00,00,00,00,00,00,00,00,0
11610 DATA 00,00,00,00,00,00,00,00,0
11620 DATA 00,00,00,00,00,00,00,00,0
11630 DATA 00,00,00,00,00,00,00,00,0
11640 DATA 00,00,00,00,00,00,00,00,0
11650 DATA 00,00,00,00,00,00,00,00,0
11660 DATA 00,00,00,00,00,00,00,00,0
11670 DATA 00,00,00,00,00,00,00,00,0
11680 DATA 00,00,00,00,00,00,00,00,0
11690 DATA 00,00,00,00,00,00,00,00,0
11700 DATA 00,00,00,00,00,00,00,00,0
11710 DATA 00,00,00,00,00,00,00,00,0
11720 DATA 00,00,00,00,00,00,00,00,0
11730 DATA 00,00,00,00,00,00,00,00,0
11740 DATA 00,00,00,00,00,00,00,00,0
11750 DATA 00,00,00,00,00,00,00,00,0
11760 DATA 00,00,00,00,00,00,00,00,0
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11770 DATA 00,00,00,00,00,00,00,00,0
11780 DATA 00,00,00,00,00,00,00,00,0
11790 DATA 00,00,00,00,00,00,00,00,0
11800 DATA 00,00,00,00,00,00,00,00,0
11810 DATA 00,00,00,00,00,00,00,00,0
11820 DATA 00,00,00,00,00,00,00,00,0
11830 DATA 00,00,00,00,00,00,00,00,0
11840 DATA 00,00,00,00,00,00,00,00,0
11850 DATA 00,00,00,00,00,00,00,00,0
11860 DATA 00,00,00,00,00,00,00,00,0
11870 DATA 00,00,00,00,00,00,00,00,0
11880 DATA 00,00,00,00,00,00,00,00,0
11890 DATA 00,00,00,00,00,00,00,00,0
11900 DATA 00,00,00,00,00,00,00,00,0
11910 DATA 00,00,00,00,00,00,00,00,0
11920 DATA 00,00,00,00,00,00,00,00,0
11930 DATA 00,00,00,00,00,00,00,00,0
11940 DATA 00,00,00,00,00,00,00,00,0
11950 DATA 00,00,00,00,00,00,00,00,0
11960 DATA 00,00,00,00,00,00,00,00,0
11970 DATA 00,00,00,00,00,00,00,00,0
11980 DATA 00,00,00,00,00,00,00,00,0
11990 DATA 00,00,00,00,00,00,00,00,0
12000 DATA 00,00,00,00,00,00,00,00,0
12010 DATA 00,00,00,00,00,00,00,00,0
12020 DATA 00,00,00,00,00,00,00,00,0
12030 DATA 00,00,00,00,00,00,00,00,0
12040 DATA 00,00,00,00,00,00,00,00,0
12050 DATA 00,00,00,00,00,00,00,00,0
12060 DATA 00,00,00,00,00,00,00,00,0
12070 DATA 00,00,00,00,00,00,00,00,0
12080 DATA 00,00,00,00,00,00,00,00,0
12090 DATA 00,00,00,00,00,00,00,00,0
12100 DATA 00,00,00,00,00,00,00,00,0
12110 DATA 00,00,00,00,00,00,00,00,0
12120 DATA 00,00,00,00,00,00,00,00,0
12130 DATA 00,00,00,00,00,00,00,00,0
12140 DATA 00,00,00,00,00,00,00,00,0
12150 DATA 00,00,00,00,00,00,00,00,0
12160 DATA 00,00,00,00,00,00,00,00,0
12170 DATA 00,00,00,00,00,00,00,00,0
12180 DATA 00,00,00,00,00,00,00,00,0
12190 DATA 00,00,00,00,00,00,00,00,0
12200 DATA 00,00,00,00,00,00,00,00,0
12210 DATA 00,00,00,00,00,00,00,00,0
12220 DATA 00,00,00,00,00,00,00,00,0
12230 DATA 00,00,00,00,00,00,00,00,0
12240 DATA 00,00,00,00,00,00,00,00,0
12250 DATA 00,00,00,00,00,00,00,00,0
12260 DATA 00,00,00,00,00,00,00,00,0
12270 DATA 00,00,00,00,00,00,00,00,0
12280 DATA 00,00,00,00,00,00,00,00,0
12290 DATA 00,00,00,00,00,00,00,00,0
12300 DATA 00,00,00,00,00,00,00,00,0
12310 DATA 00,00,00,00,00,00,00,00,0
12320 DATA 00,00,00,00,00,00,00,00,0
12330 DATA 00,00,00,00,00,00,00,00,0
12340 DATA 00,00,00,00,00,00,00,00,0
12350 DATA 00,00,00,00,00,00,00,00,0
12360 DATA 00,00,00,00,00,00,00,00,0
12370 DATA 00,00,00,00,00,00,00,00,0
12380 DATA 00,00,00,00,00,00,00,00,0
12390 DATA 00,00,00,00,00,00,00,00,0
12400 DATA 00,00,00,00,00,00,00,00,0
12410 DATA 00,00,00,00,00,00,00,00,0
12420 DATA 00,00,00,00,00,00,00,00,0
12430 DATA 00,00,00,00,00,00,00,00,0
12440 DATA 00,00,00,00,00,00,00,00,0
12450 DATA 00,00,00,00,00,00,00,00,0
12460 DATA 00,00,00,00,00,00,00,00,0
12470 DATA 00,00,00,00,00,00,00,00,0
12480 DATA 00,00,00,00,00,00,00,00,0
12490 DATA 00,00,00,00,00,00,00,00,0
12500 DATA 00,00,00,00,00,00,00,00,0
12510 DATA 00,00,00,00,00,00,00,00,0
12520 DATA 00,00,00,00,00,00,00,00,0
12530 DATA 00,00,00,00,00,00,00,00,0
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12540 DATA 00,00,00,00,00,00,00,00,0
12550 DATA 00,00,00,00,00,00,00,00,0
12560 DATA 00,00,00,00,00,00,00,00,0
12570 DATA 00,00,00,00,00,00,00,00,0
12580 DATA 00,00,00,00,00,00,00,00,0
12590 DATA 00,00,00,00,00,00,00,00,0
12600 DATA 00,00,00,00,00,00,00,00,0
12610 DATA 00,00,00,00,00,00,00,00,0
12620 DATA 00,00,00,00,00,00,00,00,0
12630 DATA 00,00,00,00,00,00,00,00,0
12640 DATA 00,00,00,00,00,00,00,00,0
12650 DATA 00,00,00,43,4F,4E,47,52,377
12660 DATA 41,54,55,4C,41,54,49,4F,611
12670 DATA 4E,53,21,21,21,20,59,4F,460
12680 DATA 55,20,48,41,56,45,20,47,512
12690 DATA 41,49,4E,45,44,20,41,20,482
12700 DATA 20,20,20,50,4C,41,43,45,453
12710 DATA 20,49,4E,20,54,48,45,20,472
12720 DATA 48,49,47,48,20,53,43,4F,549
12730 DATA 52,45,20,54,41,42,4C,45,543
12740 DATA 20,20,20,20,20,20,20,20,256
12750 DATA 20,20,20,0A,0D,50,4C,45,344
12760 DATA 41,53,45,20,45,4E,54,45,549
12770 DATA 52,20,59,4F,55,52,20,4E,559
12780 DATA 41,4D,45,20,42,45,4C,4F,533
12790 DATA 57,20,3A,2D,20,20,20,20,350
12800 DATA 20,20,20,20,20,3E,3E,3E,346
12810 DATA 3E,20,20,20,20,20,20,20,286
12820 DATA 20,20,20,20,20,20,20,20,256
12830 DATA 20,20,20,20,20,20,20,20,256
12840 DATA 20,20,20,20,20,20,20,20,256
12850 DATA 20,3C,3C,3C,3C,30,30,34,420
12860 DATA 31,30,30,30,34,30,30,30,389
12870 DATA 30,33,30,30,30,30,32,35,394
12880 DATA 30,30,30,32,34,30,30,30,390
12890 DATA 32,33,30,30,30,32,30,30,391
12900 DATA 30,30,31,30,30,39,39,39,412
12910 DATA 39,39,00,00,00,00,00,00,114
12920 DATA 00,00,00,00,00,00,00,00,0
12930 DATA 00,00,00,00,00,00,00,00,0
12940 DATA 00,00,00,00,00,00,00,00,0
12950 DATA 00,00,00,00,00,00,00,00,0
12960 DATA 00,00,00,00,00,00,00,00,0
12970 DATA 00,00,00,00,00,00,00,00,0
12980 DATA 00,00,00,00,00,00,00,00,0
12990 DATA 00,00,00,00,00,00,00,00,0
13000 DATA 00,00,00,00,00,00,00,00,0
13010 DATA 00,00,F3,CD,5A,6C,F3,FB,1140
13020 DATA 76,F3,11,00,00,FB,76,F3,990
13030 DATA CD,19,BD,F3,01,00,7F,3A,848
13040 DATA 09,55,3C,32,09,55,67,FB,652
13050 DATA 76,76,F3,7C,E6,1F,C6,40,1126
13060 DATA 6F,3E,02,ED,79,7D,ED,79,1016
13070 DATA DD,22,0A,55,DD,21,00,00,604
13080 DATA DD,21,00,00,DD,21,00,00,508
13090 DATA DD,21,00,00,DD,21,00,00,508
13100 DATA DD,21,00,00,DD,21,00,00,508
13110 DATA DD,21,00,00,DD,21,00,00,508
13120 DATA 25,1D,C2,C3,76,15,C2,B7,971
13130 DATA 76,C9,CD,66,77,AF,CD,96,1275
13140 DATA BB,3E,02,CD,90,BB,3E,0C,861
13150 DATA CD,5A,BB,CD,D6,62,21,C5,1229
13160 DATA 6F,06,C8,CD,15,5C,E5,3E,926
13170 DATA 03,CD,90,BB,E1,06,51,CD,1056
13180 DATA 15,5C,21,0A,01,CD,75,BB,666
13190 DATA 0E,08,11,25,76,21,DE,70,561
13200 DATA EB,06,05,CD,15,5C,3E,30,674
13210 DATA CD,5A,BB,3E,20,CD,5A,BB,1058
13220 DATA EB,06,20,CD,15,5C,3E,0D,666
13230 DATA CD,5A,BB,3E,0A,CD,5A,BB,1036
13240 DATA CD,5A,BB,0D,C2,38,77,CD,1069
13250 DATA AE,62,CD,AA,76,C9,AF,32,1191
13260 DATA 83,58,11,8C,5A,21,25,76,654
13270 DATA 06,05,11,8C,5A,E5,7E,4F,692
13280 DATA 1A,B9,CA,83,77,F2,99,77,1177
13290 DATA FA,87,77,23,13,10,EF,E1,1038
13300 DATA 01,05,00,09,3A,83,58,3C,352
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13310 DATA 32,83,58,FE,08,C2,70,77,956
13320 DATA C9,11,6E,73,E1,E5,01,28,938
13330 DATA 00,ED,B0,D1,D5,13,13,13,892
13340 DATA 13,13,21,6E,73,01,28,00,337
13350 DATA ED,B0,D1,21,8C,5A,01,05,891
13360 DATA 00,ED,B0,CD,F4,77,3A,83,1170
13370 DATA 58,3C,47,11,20,00,21,BE,491
13380 DATA 70,19,10,FD,22,92,5A,11,693
13390 DATA F3,73,01,2C,01,ED,B0,2A,859
13400 DATA 92,5A,01,20,00,09,EB,21,546
13410 DATA F3,73,01,2C,01,ED,B0,21,850
13420 DATA D2,73,ED,5B,92,5A,01,20,922
13430 DATA 00,ED,B0,C9,CD,D6,62,CD,1336
13440 DATA 00,BB,3E,01,CD,0E,BC,21,690
13450 DATA 0A,01,CD,75,BB,21,83,75,801
13460 DATA 06,A2,CD,15,5C,21,D2,73,844
13470 DATA 11,D3,73,01,21,00,36,20,463
13480 DATA ED,B0,AF,32,8B,5A,3E,01,930
13490 DATA CD,96,BB,CD,AE,62,21,0E,1066
13500 DATA 05,CD,75,BB,21,D2,73,06,878
13510 DATA 20,CD,15,5C,3A,8B,5A,C6,835
13520 DATA 05,67,2E,0E,CD,75,BB,3E,739
13530 DATA CF,CD,5A,BB,CD,06,BB,FE,1341
13540 DATA 7F,CA,7F,78,FE,0D,CA,6E,1155
13550 DATA 78,E6,7F,47,E6,E0,CA,26,1242
13560 DATA 78,3A,8B,5A,5F,16,00,21,557
13570 DATA D2,73,19,70,3C,32,8B,5A,801
13580 DATA FE,20,C2,26,78,C9,3A,8B,1036
13590 DATA 5A,A7,C0,21,3D,55,11,D2,855
13600 DATA 73,01,1E,00,ED,B0,C9,3A,818
13610 DATA 8B,5A,A7,C2,8E,78,3E,07,921
13620 DATA CD,5A,BB,C3,26,78,3D,32,946
13630 DATA 8B,5A,5F,16,00,21,D2,73,704
13640 DATA 19,36,20,C3,26,78,01,00,465
13650 DATA 00,E8,03,00,0F,F4,01,88,631
13660 DATA 79,10,7D,12,7F,00,3E,01,470
13670 DATA 32,9E,78,AF,32,AD,78,CD,1051
13680 DATA A7,BC,21,88,79,22,A7,78,966
13690 DATA 21,10,7D,22,A9,78,21,12,548
13700 DATA 7F,22,AB,78,C3,40,79,7E,958
13710 DATA 32,A1,78,23,7E,FE,FF,C8,1201
13720 DATA 32,A2,78,23,7E,32,A5,78,828
13730 DATA 23,7E,32,A6,78,23,7E,32,708
13740 DATA 9E,78,23,23,E5,21,9E,78,888
13750 DATA CD,AA,BC,E1,C9,2A,AB,78,1322
13760 DATA 3E,07,32,A4,78,CD,CF,78,935
13770 DATA 22,AB,78,3A,9E,78,7E,FE,1041
13780 DATA FF,C0,32,AD,78,C9,2A,A7,1200
13790 DATA 78,3E,07,32,A4,78,CD,CF,935
13800 DATA 78,22,A7,78,3A,9E,78,7E,903
13810 DATA FE,FF,C0,32,AD,78,C9,2A,1287
13820 DATA A9,78,3E,07,32,A4,78,CD,897
13830 DATA CF,78,3A,9E,78,22,A9,78,986
13840 DATA 7E,FE,FF,C0,32,AD,78,C9,1371
13850 DATA CD,09,BB,D8,3E,01,CD,AD,1058
13860 DATA BC,E6,3F,FE,04,CC,0E,79,1078
13870 DATA 3E,02,CD,AD,BC,E6,3F,FE,1177
13880 DATA 04,CC,27,79,3E,04,CD,AD,812
13890 DATA BC,E6,3F,FE,04,CC,F5,78,1308
13900 DATA 3E,07,CD,B3,BC,3A,AD,78,992
13910 DATA A7,CA,40,79,C9,06,00,76,879
13920 DATA 10,FD,3E,07,CD,B3,BC,06,916
13930 DATA 1E,CD,19,BD,10,FB,C9,C9,1118
13940 DATA 9F,00,1E,00,01,00,9F,00,349
13950 DATA 1E,00,01,00,A9,00,1E,00,230
13960 DATA 01,00,D5,00,1E,00,01,00,245
13970 DATA BE,00,0F,00,31,00,A9,00,423
13980 DATA 0F,00,01,00,BE,00,0F,00,221
13990 DATA 01,00,A9,00,0F,00,01,00,186
14000 DATA D5,00,1E,00,01,00,FD,00,497
14010 DATA 1E,00,01,00,EF,00,0F,00,285
14020 DATA 31,00,D5,00,0F,00,01,00,278
14030 DATA EF,00,0F,00,01,00,D5,00,468
14040 DATA 0F,00,01,00,FD,00,1E,00,299
14050 DATA 01,00,1C,01,1E,00,01,00,61
14060 DATA 3F,01,1E,00,31,00,7B,01,267
14070 DATA 3C,00,01,00,3F,01,0F,00,140
14080 DATA 01,00,52,01,0F,00,01,00,100
14090 DATA 7B,01,0F,00,31,00,52,01,271
14100 DATA 0F,00,01,00,7B,01,0F,00,155
14110 DATA 01,00,52,01,0F,00,01,00,100
14120 DATA AA,01,1E,00,01,00,3F,01,266
14130 DATA 0F,00,01,00,52,01,0F,00,114
14140 DATA 01,00,7B,01,0F,00,31,00,189
14150 DATA 52,01,0F,00,01,00,7B,01,223
14160 DATA 0F,00,01,00,52,01,0F,00,114
14170 DATA 01,00,AA,01,1E,00,01,00,203
14180 DATA AA,01,0F,00,01,00,7B,01,311
14190 DATA 0F,00,01,00,52,01,0F,00,114
14200 DATA 31,00,3F,01,0F,00,01,00,129
14210 DATA 1C,01,0F,00,01,00,FD,00,298
14220 DATA 0F,00,01,00,EF,00,0F,00,270
14230 DATA 01,00,FD,00,0F,00,01,00,270
14240 DATA EF,00,0F,00,01,00,D5,00,468
14250 DATA 0F,00,01,00,FD,00,1E,00,299
14260 DATA 31,00,3F,01,3C,00,01,00,174
14270 DATA 1C,01,0F,00,01,00,FD,00,298
14280 DATA 0F,00,01,00,E1,00,0F,00,256
14290 DATA 31,00,D5,00,0F,00,01,00,278
14300 DATA BE,00,0F,00,01,00,A9,00,375
14310 DATA 0F,00,01,00,9F,00,0F,00,190
14320 DATA 01,00,A9,00,0F,00,01,00,186
14330 DATA 9F,00,0F,00,01,00,8E,00,317
14340 DATA 0F,00,01,00,A9,00,1E,00,215
14350 DATA 31,00,D5,00,44,00,01,00,331
14360 DATA BE,00,1E,00,31,00,BE,00,459
14370 DATA 1E,00,01,00,BE,00,0F,00,236
14380 DATA 01,00,A9,00,0F,00,01,00,186
14390 DATA 9F,00,0F,00,01,00,8E,00,317
14400 DATA 0F,00,01,00,9F,00,0F,00,190
14410 DATA 31,00,A9,00,0F,00,01,00,234
14420 DATA BE,00,0F,00,01,00,A9,00,375
14430 DATA 0F,00,01,00,9F,00,1E,00,205
14440 DATA 01,00,D5,00,1E,00,01,00,245
14450 DATA EF,00,1E,00,31,00,EF,00,557
14460 DATA 1E,00,01,00,EF,00,0F,00,285
14470 DATA 01,00,D5,00,0F,00,01,00,230
14480 DATA BE,00,0F,00,01,00,A9,00,375
14490 DATA 0F,00,01,00,BE,00,0F,00,221
14500 DATA 31,00,C9,00,0F,00,01,00,266
14510 DATA E1,00,0F,00,01,00,C9,00,442
14520 DATA 0F,00,01,00,BE,00,1E,00,236
14530 DATA 01,00,7B,01,0F,00,01,00,141
14540 DATA 52,01,0F,00,01,00,3F,01,163
14550 DATA 0F,00,31,00,52,01,0F,00,162
14560 DATA 01,00,7B,01,0F,00,01,00,141
14570 DATA 52,01,0F,00,01,00,3F,01,163
14580 DATA 1E,00,01,00,3F,01,0F,00,110
14590 DATA 01,00,1C,01,0F,00,01,00,46
14600 DATA FD,00,0F,00,31,00,1C,01,346
14610 DATA 0F,00,01,00,3F,01,0F,00,95
14620 DATA 01,00,1C,01,0F,00,01,00,46
14630 DATA FD,00,1E,00,01,00,FD,00,537
14640 DATA 1E,00,01,00,FD,00,0F,00,299
14650 DATA 31,00,1C,01,0F,00,01,00,94
14660 DATA 3F,01,0F,00,01,00,1C,01,109
14670 DATA 0F,00,01,00,FD,00,1E,00,299
14680 DATA 01,00,BE,00,1E,00,01,00,222
14690 DATA FD,00,1E,00,31,00,7B,01,456
14700 DATA 1E,00,01,00,7B,01,1E,00,185
14710 DATA 01,00,3F,01,0F,00,01,00,81
14720 DATA 1C,01,0F,00,01,00,FD,00,298
14730 DATA 0F,00,31,00,1C,01,0F,00,108
14740 DATA 01,00,3F,01,0F,00,01,00,81
14750 DATA 1C,01,0F,00,01,00,FD,00,298
14760 DATA 1E,00,01,00,FD,00,0F,00,299
14770 DATA 01,00,E1,00,0F,00,01,00,242
14780 DATA D5,00,0F,00,31,00,E1,00,502
14790 DATA 0F,00,01,00,FD,00,0F,00,284
14800 DATA 01,00,E1,00,0F,00,01,00,242
14810 DATA D5,00,1E,00,01,00,9F,00,403
14820 DATA 0F,00,01,00,9F,00,0F,00,190
14830 DATA 01,00,A9,00,0F,00,31,00,234
14840 DATA BE,00,0F,00,01,00,D5,00,419
14850 DATA 0F,00,01,00,BE,00,0F,00,221
14860 DATA 01,00,A9,00,1E,00,01,00,201
14870 DATA 7F,00,1E,00,01,00,A9,00,327
14880 DATA 1E,00,31,00,FD,00,1E,00,362
14890 DATA 01,00,FD,00,1E,00,01,00,285
14900 DATA D5,00,0F,00,01,00,BE,00,419
14910 DATA 0F,00,01,00,A9,00,0F,00,200
14920 DATA 31,00,BE,00,0F,00,01,00,255
14930 DATA D5,00,0F,00,01,00,BE,00,419
14940 DATA 0F,00,01,00,A9,00,1E,00,215
14950 DATA 01,00,7F,00,1E,00,01,00,159
14960 DATA 8E,00,1E,00,31,00,9F,00,380
14970 DATA 1E,00,01,00,BE,00,1E,00,251
14980 DATA 01,00,A9,00,1E,00,01,00,201
14990 DATA 7E,02,0F,00,31,00,A4,02,358
15000 DATA ***
```

Program 5

```
5 REM program5
6 PRINT"Program 5 is running":PRINT"Working on line"
10 valid$="0123456789ABCDEF":ln=15000
20 x=31960
30 FOR y=0 TO 7
40 READ num$:IF num$="***" THEN 110
50 IF INSTR(valid$,LEFT$(num$,1)) OR INSTR (valid$,RIGHT$(num$,1)) THEN num=VAL("&"+num$):POKE x+y,num ELSE 120
60 chk=chk+num
70 NEXT:ln=ln+10
80 READ check:IF chk<>check THEN 130
90 chk=0
95 PRINT ln;CHR$(11)
100 x=x+8:GOTO 30
110 PRINT"bytes=";x+y
115 RUN"program6
120 PRINT"Invalid character in line ";ln:END
130 PRINT"Checksum error in line ";ln:END
15000 DATA 0F,00,01,00,F6,02,0F,00,279
15010 DATA 01,00,53,03,0F,00,01,00,103
15020 DATA BC,03,0F,00,01,00,F4,03,454
15030 DATA 0F,00,01,00,70,04,0F,00,147
15040 DATA 01,00,00,00,3C,00,31,00,110
15050 DATA 00,00,3C,00,31,00,00,00,109
15060 DATA 3C,00,01,00,FF,FF,FF,FF,1081
15070 DATA FD,00,1E,00,02,00,FD,00,538
15080 DATA 1E,00,02,00,1C,01,1E,00,91
15090 DATA 02,00,52,01,1E,00,02,00,117
15100 DATA 3F,01,1E,00,2A,00,3F,01,200
15110 DATA 1E,00,02,00,3F,01,1E,00,126
15120 DATA 02,00,3F,01,1E,00,02,00,98
15130 DATA 3F,01,1E,00,2A,00,3F,01,200
15140 DATA 1E,00,02,00,52,01,1E,00,145
15150 DATA 02,00,52,01,1E,00,02,00,117
15160 DATA FA,01,1E,00,2A,00,FA,01,574
15170 DATA 3C,00,02,00,FA,01,1E,00,343
15180 DATA 02,00,DE,01,1E,00,2A,00,297
```

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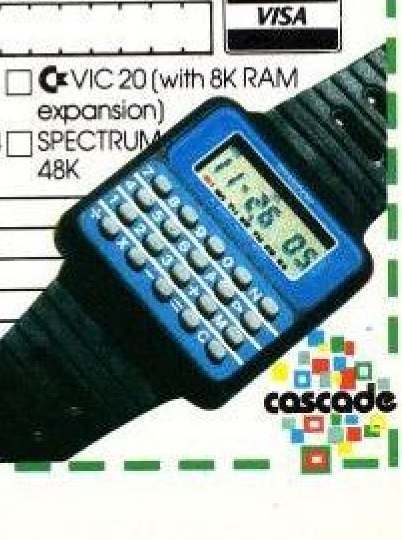
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15190 DATA DE,01,1E,00,02,00,7E,02,383
15200 DATA 1E,00,02,00,FA,01,1E,00,313
15210 DATA 02,00,DE,01,1E,00,2A,00,297
15220 DATA DE,01,1E,00,02,00,7E,02,383
15230 DATA 1E,00,02,00,7E,02,1E,00,190
15240 DATA 02,00,DE,01,1E,00,2A,00,297
15250 DATA 7B,01,1E,00,02,00,52,01,239
15260 DATA 1E,00,02,00,52,01,1E,00,145
15270 DATA 02,00,3F,01,1E,00,2A,00,138
15280 DATA FA,01,3C,00,02,00,C3,01,509
15290 DATA 1E,00,02,00,3F,01,1E,00,126
15300 DATA 2A,00,3F,01,1E,00,02,00,138
15310 DATA E1,00,1E,00,02,00,E1,00,482
15320 DATA 1E,00,02,00,D5,00,1E,00,275
15330 DATA 2A,00,52,01,44,00,02,00,195
15340 DATA 2D,01,1E,00,2A,00,2D,01,164
15350 DATA 1E,00,02,00,1C,01,1E,00,91
15360 DATA 02,00,1C,01,1E,00,02,00,63
15370 DATA 52,01,1E,00,2A,00,52,01,238
15380 DATA 1E,00,02,00,3F,01,1E,00,126
15390 DATA 02,00,3F,01,1E,00,02,00,98
15400 DATA 3F,01,1E,00,2A,00,3F,01,200
15410 DATA 1E,00,02,00,1C,01,1E,00,91
15420 DATA 02,00,1C,01,1E,00,02,00,63
15430 DATA 92,01,1E,00,2A,00,92,01,366
15440 DATA 1E,00,02,00,7B,01,1E,00,186
15450 DATA 02,00,DE,01,1E,00,02,00,257
15460 DATA FA,01,3C,00,2A,00,FA,01,604
15470 DATA 3C,00,02,00,7E,02,3C,00,250
15480 DATA 2A,00,7E,02,3C,00,02,00,232
15490 DATA 7E,02,3C,00,2A,00,7E,02,358
15500 DATA 3C,00,02,00,7E,02,0F,00,205
15510 DATA 2A,00,7E,02,0F,00,02,00,187
15520 DATA 7E,02,0F,00,02,00,00,00,145
15530 DATA 0F,00,02,00,7E,02,3C,00,205
15540 DATA 2A,00,7E,02,3C,00,02,00,232
15550 DATA FA,01,3C,00,2A,00,FA,01,604
15560 DATA 3C,00,02,00,AA,01,3C,00,293
15570 DATA 2A,00,AA,01,3C,00,02,00,275
15580 DATA A4,02,3C,00,2A,00,A4,02,434
15590 DATA 3C,00,02,00,AA,01,3C,00,293
15600 DATA 2A,00,AA,01,3C,00,02,00,275
15610 DATA 52,01,1E,00,2A,00,FD,00,408
15620 DATA 1E,00,02,00,3F,01,1E,00,126
15630 DATA 02,00,EF,00,1E,00,02,00,273
15640 DATA 9F,00,0F,00,1C,00,A9,00,371
15650 DATA 0F,00,04,00,BE,00,0F,00,224
15660 DATA 04,00,D5,00,0F,00,04,00,236
15670 DATA EF,00,0F,00,04,00,FD,00,511
15680 DATA 0F,00,04,00,1C,01,0F,00,63
15690 DATA 04,00,00,00,3C,00,2A,00,106
15700 DATA 00,00,3C,00,2A,00,FF,FF,612
15710 DATA FF,FF,7E,02,1E,00,04,00,672
15720 DATA 7E,02,1E,00,04,00,AA,01,333
15730 DATA 1E,00,04,00,AA,01,1E,00,235
15740 DATA 04,00,DE,01,1E,00,1C,00,285
15750 DATA DE,01,1E,00,04,00,7E,02,385
15760 DATA 1E,00,04,00,7E,02,1E,00,192
15770 DATA 04,00,38,02,1E,00,1C,00,120
15780 DATA 38,02,1E,00,04,00,53,03,178
15790 DATA 1E,00,04,00,53,03,1E,00,150
15800 DATA 04,00,7E,02,1E,00,1C,00,190
15810 DATA 7E,02,3C,00,04,00,7E,02,320
15820 DATA 1E,00,04,00,BC,03,1E,00,255
15830 DATA 1C,00,BC,03,1E,00,04,00,253
15840 DATA F4,03,1E,00,04,00,7E,02,409
15850 DATA 1E,00,04,00,BC,03,1E,00,255
15860 DATA 1C,00,BC,03,1E,00,04,00,253
15870 DATA F4,03,1E,00,04,00,F4,03,528
15880 DATA 1E,00,04,00,70,04,1E,00,180
15890 DATA 1C,00,BC,03,1E,00,04,00,253
15900 DATA 53,03,1E,00,04,00,53,03,206
15910 DATA 1E,00,04,00,7E,02,1E,00,192
15920 DATA 1C,00,7E,02,3C,00,04,00,220
15930 DATA 7E,02,1E,00,04,00,F6,02,410
15940 DATA 1E,00,1C,00,F6,02,1E,00,336
15950 DATA 04,00,38,02,1E,00,04,00,96
15960 DATA 38,02,1E,00,04,00,53,03,178
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15970 DATA 1E,00,1C,00,AA,01,5A,00,319
15980 DATA 04,00,AA,01,1E,00,1C,00,233
15990 DATA AA,01,1E,00,04,00,DE,01,428
16000 DATA 1E,00,04,00,DE,01,1E,00,287
16010 DATA 04,00,DE,01,1E,00,1C,00,285
16020 DATA DE,01,1E,00,04,00,FA,01,508
16030 DATA 1E,00,04,00,FA,01,1E,00,315
16040 DATA 04,00,38,02,1E,00,1C,00,120
16050 DATA 38,02,1E,00,04,00,A4,02,258
16060 DATA 1E,00,04,00,A4,02,1E,00,230
16070 DATA 04,00,38,02,1E,00,1C,00,120
16080 DATA 38,02,1E,00,04,00,7E,02,220
16090 DATA 1E,00,04,00,7E,02,1E,00,192
16100 DATA 04,00,F6,02,3C,00,1C,00,340
16110 DATA F6,02,3C,00,04,00,53,03,398
16120 DATA 3C,00,1C,00,53,03,3C,00,234
16130 DATA 04,00,86,03,3C,00,1C,00,229
16140 DATA 86,03,3C,00,04,00,F6,02,449
16150 DATA 1E,00,1C,00,F6,02,1E,00,336
16160 DATA 04,00,00,00,1E,00,04,00,38
16170 DATA 86,03,3C,00,1C,00,86,03,362
16180 DATA 3C,00,04,00,53,03,3C,00,210
16190 DATA 1C,00,53,03,3C,00,04,00,178
16200 DATA A4,02,3C,00,1C,00,A4,02,420
16210 DATA 3C,00,04,00,53,03,3C,00,210
16220 DATA 1C,00,53,03,3C,00,04,00,178
16230 DATA A4,02,3C,00,1C,00,A4,02,420
16240 DATA 3C,00,04,00,DE,01,1E,00,317
16250 DATA 1C,00,7E,02,1E,00,04,00,190
16260 DATA DE,01,1E,00,04,00,AA,01,428
16270 DATA 1E,00,04,00,3F,01,0F,00,113
16280 DATA 1C,00,52,01,0F,00,02,00,128
16290 DATA 7B,01,0F,00,02,00,AA,01,312
16300 DATA 0F,00,02,00,DE,01,0F,00,255
16310 DATA 02,00,FA,01,0F,00,02,00,270
16320 DATA 38,02,0F,00,02,00,00,00,75
16330 DATA 3C,00,1C,00,00,00,3C,00,148
16340 DATA 1C,00,00,00,3C,00,04,00,92
16350 DATA 04,04,04,04,04,04,04,04,32
16360 DATA 04,04,04,04,04,04,04,04,32
16370 DATA 04,04,04,04,03,03,02,01,25
16380 DATA 01,01,02,01,01,01,01,02,10
16390 DATA 01,01,02,02,01,01,04,04,16
16400 DATA 03,02,01,01,01,01,03,02,14
16410 DATA 01,01,02,01,01,03,01,01,11
16420 DATA 06,02,04,04,02,01,01,01,21
16430 DATA 01,01,02,01,01,02,01,01,10
16440 DATA 01,03,01,01,01,02,04,04,17
16450 DATA 01,01,01,01,04,04,04,04,20
16460 DATA 04,04,04,04,04,04,04,04,32
16470 DATA 04,04,04,04,02,03,02,01,24
16480 DATA 01,02,02,02,01,01,03,01,13
16490 DATA 01,01,01,01,03,01,04,04,16
16500 DATA 02,03,02,01,01,01,02,02,14
16510 DATA 04,02,03,04,01,01,01,01,17
16520 DATA 03,01,04,04,02,03,02,01,20
16530 DATA 01,01,01,02,04,03,03,04,19
16540 DATA 01,01,01,01,03,01,04,04,16
16550 DATA 04,04,04,04,04,04,04,04,32
16560 DATA 04,04,04,04,04,04,01,02,27
16570 DATA 03,01,04,04,03,02,02,02,21
16580 DATA 02,02,02,03,02,02,02,02,17
16590 DATA 02,02,01,02,03,01,04,04,19
16600 DATA 01,01,01,01,01,01,01,01,8
16610 DATA 01,01,01,01,01,01,01,01,8
16620 DATA 03,01,04,04,04,04,04,04,28
16630 DATA 04,04,04,04,04,04,04,04,32
16640 DATA 04,04,04,04,04,04,04,04,32
16650 DATA 03,03,01,01,01,02,01,03,15
16660 DATA 06,04,02,04,01,01,03,01,22
16670 DATA 01,01,04,04,02,02,01,01,16
16680 DATA 01,01,01,01,01,01,01,01,8
16690 DATA 01,01,01,01,01,02,04,04,15
16700 DATA 02,03,01,04,04,04,04,04,26
16710 DATA 04,04,01,04,04,04,01,01,23
16720 DATA 02,02,04,04,01,01,01,04,19
16730 DATA 01,01,01,01,00,00,01,00,5
16740 DATA 00,04,01,02,02,02,04,04,19
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16750 DATA 02,01,02,04,01,04,04,04,22
16760 DATA 00,04,04,04,00,04,01,02,19
16770 DATA 02,03,04,04,02,01,02,04,22
16780 DATA 01,04,03,04,00,02,01,04,19
16790 DATA 00,04,01,02,01,01,04,04,17
16800 DATA 02,01,02,04,01,04,03,04,21
16810 DATA 01,04,01,04,00,04,00,01,15
16820 DATA 01,01,04,04,02,01,02,04,19
16830 DATA 01,04,01,01,01,04,01,04,17
16840 DATA 03,04,00,01,03,01,04,04,20
16850 DATA 01,01,01,04,01,04,04,04,20
16860 DATA 04,04,01,04,03,04,00,01,21
16870 DATA 02,01,04,04,01,03,01,04,20
16880 DATA 01,01,01,01,01,01,01,01,8
16890 DATA 03,04,00,01,01,01,04,04,18
16900 DATA 04,04,04,04,04,04,04,04,32
16910 DATA 04,04,04,04,04,04,04,04,32
16920 DATA 04,04,04,04,02,02,01,03,24
16930 DATA 03,02,02,03,02,02,03,02,19
16940 DATA 02,01,01,02,03,04,04,04,21
16950 DATA 02,01,01,03,02,03,02,02,16
16960 DATA 02,03,02,03,02,01,02,03,18
16970 DATA 04,04,04,04,01,01,01,03,22
16980 DATA 03,02,02,02,02,02,03,02,18
16990 DATA 02,01,01,02,00,04,04,04,18
17000 DATA 01,01,01,01,03,02,02,03,14
17010 DATA 01,03,02,03,01,01,02,03,16
17020 DATA 02,04,04,04,01,02,04,04,25
17030 DATA 04,04,01,04,04,04,01,04,26
17040 DATA 04,04,04,04,04,04,04,04,32
17050 DATA 01,03,04,00,00,00,00,00,8
17060 DATA 00,00,00,00,00,00,00,00,0
17070 DATA 00,00,04,04,01,02,04,00,15
17080 DATA 00,00,00,00,06,00,00,00,6
17090 DATA 00,00,00,00,00,00,04,04,8
17100 DATA 03,01,04,01,00,00,00,00,9
17110 DATA 00,00,00,00,00,03,01,03,7
17120 DATA 00,00,04,04,03,01,04,01,17
17130 DATA 01,00,00,00,00,00,00,00,1
17140 DATA 02,02,01,02,02,00,04,04,17
17150 DATA 02,01,04,01,01,01,00,00,10
17160 DATA 00,00,00,02,02,03,03,03,13
17170 DATA 02,02,04,04,04,04,04,04,28
17180 DATA 04,04,04,04,04,04,04,04,32
17190 DATA 04,04,04,04,04,04,04,04,32
17200 DATA 06,01,01,01,01,01,01,01,13
17210 DATA 01,01,01,01,01,01,01,01,8
17220 DATA 01,01,04,04,01,02,02,02,17
17230 DATA 01,02,03,02,01,02,02,02,15
17240 DATA 01,02,03,02,01,01,04,04,18
17250 DATA 01,02,03,03,01,02,03,02,17
17260 DATA 01,02,03,03,01,02,03,02,17
17270 DATA 01,01,04,04,01,02,03,03,19
17280 DATA 01,02,02,02,01,02,02,02,14
17290 DATA 01,02,02,02,01,01,04,04,17
17300 DATA 01,02,03,03,01,01,01,02,14
17310 DATA 01,02,03,02,01,03,03,02,17
17320 DATA 01,01,04,04,01,02,02,02,17
17330 DATA 01,01,01,02,01,02,02,02,12
17340 DATA 01,01,01,02,01,01,04,04,15
17350 DATA 01,01,01,01,01,01,01,01,8
17360 DATA 01,01,01,01,01,01,01,01,8
17370 DATA 01,01,04,04,01,04,04,04,23
17380 DATA 01,02,02,01,02,02,02,01,13
17390 DATA 02,02,02,01,02,03,04,04,20
17400 DATA 01,03,03,03,01,02,03,01,17
17410 DATA 02,01,02,01,02,01,02,01,12
17420 DATA 02,03,04,04,01,04,04,04,26
17430 DATA 01,02,02,01,02,02,02,01,13
17440 DATA 02,02,02,01,02,02,04,04,19
17450 DATA 04,04,04,04,04,04,04,04,32
17460 DATA 04,04,04,04,04,04,04,04,32
17470 DATA 04,04,04,04,01,01,01,01,20
17480 DATA 01,01,01,01,01,06,01,01,13
17490 DATA 01,01,01,01,01,01,04,04,14
17500 DATA 01,01,01,01,02,01,04,01,12
17510 DATA 01,01,01,01,01,01,01,01,8
17520 DATA 01,01,04,04,01,01,01,01,14
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17530 DATA 04,00,00,04,01,01,00,0B,21
17540 DATA 01,0B,00,01,01,01,04,04,23
17550 DATA 02,01,02,01,04,04,00,04,18
17560 DATA 01,01,01,00,01,00,00,01,5
17570 DATA 01,01,04,04,02,03,02,01,18
17580 DATA 01,04,00,00,04,01,01,01,12
17590 DATA 01,01,01,01,02,01,04,04,15
17600 DATA 02,03,02,01,01,04,04,00,17
17610 DATA 04,01,01,01,01,01,01,02,12
17620 DATA 03,02,04,04,04,04,04,01,26
17630 DATA 01,04,00,00,04,01,01,01,12
17640 DATA 01,02,01,02,02,01,04,04,17
17650 DATA 01,01,04,04,04,04,00,04,22
17660 DATA 04,04,01,01,02,03,03,02,20
17670 DATA 01,01,04,04,01,01,04,08,24
17680 DATA 00,00,00,00,08,04,01,02,15
17690 DATA 03,03,03,03,02,01,04,04,23
17700 DATA 01,01,04,04,04,04,04,04,26
17710 DATA 04,04,02,03,03,03,03,03,25
17720 DATA 03,02,04,04,04,04,04,04,29
17730 DATA 04,04,04,04,04,04,04,04,32
17740 DATA 04,04,04,04,04,04,04,04,32
17750 DATA 06,01,01,01,01,01,01,01,13
17760 DATA 01,01,01,01,01,01,01,01,8
17770 DATA 01,01,04,04,01,04,04,04,23
17780 DATA 01,04,04,04,01,04,04,04,26
17790 DATA 01,04,04,04,01,04,04,04,26
17800 DATA 01,04,01,04,01,04,00,04,19
17810 DATA 01,04,01,04,01,04,00,04,19
17820 DATA 01,04,04,04,01,04,04,04,26
17830 DATA 01,04,0B,04,01,04,04,01,30
17840 DATA 01,04,0B,04,01,04,04,04,33
17850 DATA 01,04,04,01,01,04,00,04,19
17860 DATA 01,04,01,04,01,04,00,04,19
17870 DATA 01,01,04,04,01,04,01,04,20
17880 DATA 01,04,04,04,01,04,04,04,26
17890 DATA 01,04,04,04,01,04,04,04,26
17900 DATA 01,01,01,01,01,01,01,01,8
17910 DATA 01,01,01,01,01,01,01,01,8
17920 DATA 01,01,04,04,01,02,01,01,15
17930 DATA 01,01,01,01,02,02,01,01,10
17940 DATA 01,02,02,02,02,01,04,04,18
17950 DATA 01,03,02,02,01,01,01,01,12
17960 DATA 01,02,01,01,02,03,03,03,16
17970 DATA 03,03,04,04,01,03,03,03,24
17980 DATA 02,01,01,01,03,02,01,02,13
17990 DATA 03,03,03,03,03,03,04,04,26
18000 DATA 04,04,04,04,04,04,04,04,32
18010 DATA 04,04,04,04,04,04,04,04,32
18020 DATA 04,04,04,04,02,02,02,03,25
18030 DATA 03,02,03,02,03,03,02,03,21
18040 DATA 02,03,02,02,02,02,04,04,21
18050 DATA 01,02,01,02,03,03,02,02,16
18060 DATA 03,02,02,02,03,02,01,01,16
18070 DATA 02,02,04,04,01,02,01,02,18
18080 DATA 03,02,03,03,02,03,02,03,21
18090 DATA 02,03,01,02,02,02,04,04,20
18100 DATA 01,01,01,01,03,02,02,03,14
18110 DATA 02,03,02,03,02,02,01,01,16
18120 DATA 01,02,04,04,03,02,04,04,24
18130 DATA 04,04,04,04,04,01,04,04,29
18140 DATA 04,04,04,04,01,03,04,04,28
18150 DATA 01,03,04,00,00,00,00,00,8
18160 DATA 00,00,00,00,00,00,00,04,4
18170 DATA 02,01,04,04,02,01,04,00,18
18180 DATA 00,00,00,00,00,00,00,00,0
18190 DATA 00,06,00,04,03,01,04,04,22
18200 DATA 03,01,04,00,00,00,00,00,8
18210 DATA 00,00,00,00,00,00,00,04,4
18220 DATA 03,03,04,04,03,01,04,00,22
18230 DATA 00,00,00,00,00,00,00,00,0
18240 DATA 00,00,00,04,03,02,04,04,17
18250 DATA 02,02,04,00,00,00,02,00,10
18260 DATA 02,00,00,00,00,00,00,00,2
18270 DATA 03,01,04,04,04,04,04,04,28
18280 DATA 04,04,04,04,04,04,04,04,32
18290 DATA 04,04,04,04,04,04,04,04,32
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18300 DATA 0B,00,02,01,02,06,01,02,25
18310 DATA 01,01,01,01,01,01,02,01,9
18320 DATA 01,02,04,04,01,01,01,02,16
18330 DATA 01,01,01,03,01,01,02,02,12
18340 DATA 01,01,01,01,01,03,04,04,16
18350 DATA 01,04,04,04,04,04,04,03,28
18360 DATA 04,04,04,04,04,04,04,04,32
18370 DATA 04,01,04,04,04,02,01,01,21
18380 DATA 01,01,01,03,01,02,01,01,11
18390 DATA 01,01,01,02,04,01,04,04,18
18400 DATA 04,03,01,02,01,01,01,02,15
18410 DATA 01,01,02,01,01,01,01,03,11
18420 DATA 04,01,04,04,04,03,04,04,28
18430 DATA 04,04,04,03,04,04,04,04,31
18440 DATA 04,01,04,03,04,03,04,04,27
18450 DATA 04,01,04,01,01,01,03,03,18
18460 DATA 03,01,01,02,04,01,04,01,17
18470 DATA 04,01,04,04,04,01,01,01,20
18480 DATA 04,04,04,04,04,04,04,03,31
18490 DATA 04,01,04,01,04,01,04,04,23
18500 DATA ***
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Program 6

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5 REM program 6
6 PRINT"Program 6 is running":PRINT"Work
  ing on line"
10 valid$="0123456789ABCDEF":ln=18500
20 x=34760
30 FOR y=0 TO 7
40 READ num$:IF num$="***" THEN 110
50 IF INSTR(valid$,LEFT$(num$,1)) OR INS
   TR (valid$,RIGHT$(num$,1)) THEN num=V
   AL("&"+num$):POKE x+y,num ELSE 120
60 chk=chk+num
70 NEXT:ln=ln+10
80 READ check:IF chk<>check THEN 130
90 chk=0
95 PRINT ln;CHR$(11)
100 x=x+8:GOTO 30
110 PRINT"bytes=";x+y
115 RUN"program7
120 PRINT"Invalid character in line ";ln
    :END
130 PRINT"Checksum error in line ";ln:EN
 ,  D
18500 DATA 01,04,01,04,03,03,02,03,21
18510 DATA 04,03,04,01,04,01,04,02,23
18520 DATA 04,01,01,01,01,01,01,01,11
18530 DATA 01,03,02,02,01,01,01,01,12
18540 DATA 01,01,01,03,01,01,04,04,16
18550 DATA 04,04,04,04,04,04,04,04,32
18560 DATA 04,04,04,04,04,04,04,04,32
18570 DATA 04,04,04,04,01,01,01,01,20
18580 DATA 01,01,01,01,01,01,01,02,9
18590 DATA 01,01,02,03,02,02,04,04,19
18600 DATA 01,04,02,02,02,01,02,02,16
18610 DATA 04,01,01,02,01,01,02,03,15
18620 DATA 03,03,04,04,01,01,04,01,21
18630 DATA 02,01,01,04,02,01,01,02,14
18640 DATA 01,01,02,02,02,02,04,04,18
18650 DATA 01,02,01,04,03,03,04,01,19
18660 DATA 02,01,01,03,01,03,02,02,15
18670 DATA 02,02,04,04,01,01,01,03,18
18680 DATA 04,04,03,01,02,01,01,01,17
18690 DATA 01,01,01,01,01,01,04,04,14
18700 DATA 01,02,01,03,04,04,03,01,19
18710 DATA 02,01,01,02,01,01,01,01,10
18720 DATA 01,01,04,04,01,02,01,04,18
18730 DATA 03,03,04,01,02,01,01,01,16
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18740 DATA 01,03,01,01,02,01,04,04,17
18750 DATA 01,02,04,01,01,02,01,04,16
18760 DATA 02,01,06,01,03,02,03,01,19
18770 DATA 03,02,04,04,01,04,03,01,22
18780 DATA 02,01,01,01,04,01,01,01,12
18790 DATA 02,03,02,01,01,01,04,04,18
18800 DATA 01,01,01,01,02,03,01,01,11
18810 DATA 01,01,01,01,01,02,01,01,9
18820 DATA 01,01,04,04,04,04,04,04,26
18830 DATA 04,04,04,04,04,04,04,04,32
18840 DATA 04,04,04,04,04,04,04,04,32
18850 DATA 00,01,01,02,01,02,02,02,11
18860 DATA 01,01,01,01,01,01,01,01,8
18870 DATA 01,01,04,04,00,01,02,02,15
18880 DATA 01,02,03,03,02,01,02,01,15
18890 DATA 01,02,01,01,01,01,04,04,15
18900 DATA 00,01,02,02,01,02,02,03,13
18910 DATA 02,01,01,01,01,03,02,01,12
18920 DATA 01,01,04,04,02,01,03,02,18
18930 DATA 01,03,02,02,02,02,01,01,14
18940 DATA 01,03,02,02,01,03,04,04,20
18950 DATA 01,01,04,04,04,04,04,00,22
18960 DATA 04,04,04,04,04,04,04,01,29
18970 DATA 01,02,04,04,00,01,04,00,16
18980 DATA 00,00,00,00,00,00,00,00,0
18990 DATA 01,01,04,02,03,02,04,04,21
19000 DATA 02,01,04,00,00,00,00,00,7
19010 DATA 00,06,00,00,00,01,04,01,12
19020 DATA 03,01,04,04,02,00,04,00,18
19030 DATA 00,00,00,00,00,00,00,00,0
19040 DATA 00,00,04,01,03,01,04,04,17
19050 DATA 02,01,04,00,00,00,00,00,7
19060 DATA 00,00,00,00,00,00,00,01,1
19070 DATA 03,03,04,04,03,00,00,00,17
19080 DATA 00,00,00,00,00,00,00,00,0
19090 DATA 00,00,04,01,01,01,04,04,15
19100 DATA 04,04,04,04,04,04,04,04,32
19110 DATA 04,04,04,04,04,04,04,04,32
19120 DATA 04,04,04,04,01,01,01,01,20
19130 DATA 02,02,01,01,01,01,01,01,10
19140 DATA 01,01,01,01,01,01,04,04,14
19150 DATA 01,01,01,01,03,01,01,01,10
19160 DATA 01,01,02,02,01,01,02,01,11
19170 DATA 01,01,04,04,01,01,01,04,17
19180 DATA 04,04,04,04,04,04,04,04,32
19190 DATA 04,04,02,01,01,01,04,04,21
19200 DATA 01,01,01,01,02,02,02,08,18
19210 DATA 02,02,02,02,02,02,02,01,15
19220 DATA 01,01,04,04,02,01,00,01,14
19230 DATA 03,03,03,00,03,03,03,01,19
19240 DATA 01,01,01,01,03,01,04,04,16
19250 DATA 03,01,02,04,04,04,04,04,26
19260 DATA 04,04,04,04,04,04,01,01,26
19270 DATA 01,01,04,04,01,01,02,01,15
19280 DATA 01,03,00,00,00,0B,0B,03,29
19290 DATA 03,06,01,01,02,01,04,04,22
19300 DATA 04,01,02,04,04,04,04,04,27
19310 DATA 04,04,04,04,04,04,02,01,27
19320 DATA 01,01,04,04,04,01,02,02,19
19330 DATA 02,02,0B,00,00,00,00,02,17
19340 DATA 02,02,02,01,01,01,04,04,17
19350 DATA 04,01,01,03,03,03,00,00,15
19360 DATA 00,01,01,03,03,03,01,01,13
19370 DATA 01,01,04,04,04,04,04,04,26
19380 DATA 04,04,04,04,04,04,04,04,32
19390 DATA 04,04,04,04,04,04,04,04,32
19400 DATA 02,03,01,01,02,01,01,01,12
19410 DATA 01,01,01,02,02,01,01,01,10
19420 DATA 01,01,04,04,03,01,01,01,16
19430 DATA 02,02,01,01,01,06,02,01,16
19440 DATA 01,01,01,01,02,01,04,04,15
19450 DATA 01,01,01,04,04,04,04,04,23
19460 DATA 01,04,04,04,04,04,01,01,23
19470 DATA 03,01,04,04,01,01,04,03,21
19480 DATA 03,02,01,01,01,01,01,02,12
19490 DATA 03,01,04,01,03,01,04,04,21
19500 DATA 02,04,01,03,02,01,01,01,15
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19510 DATA 02,01,02,03,01,01,01,04,15
19520 DATA 01,01,04,04,02,04,01,02,19
19530 DATA 01,02,01,02,01,01,01,01,10
19540 DATA 02,01,01,04,02,04,04,04,22
19550 DATA 02,04,01,01,01,01,01,02,13
19560 DATA 03,01,01,01,03,01,01,04,15
19570 DATA 02,04,04,04,02,04,01,02,23
19580 DATA 01,01,01,03,01,01,02,01,11
19590 DATA 01,02,01,04,02,04,04,04,22
19600 DATA 01,01,04,04,04,04,04,01,23
19610 DATA 04,04,04,04,04,04,04,01,29
19620 DATA 01,01,04,04,01,01,01,01,14
19630 DATA 01,01,01,01,01,01,01,01,8
19640 DATA 01,01,01,01,01,01,04,04,14
19650 DATA 04,04,04,04,04,04,04,04,32
19660 DATA 04,04,04,04,04,04,04,04,32
19670 DATA 04,04,04,04,06,01,01,01,25
19680 DATA 01,01,01,01,01,01,01,01,8
19690 DATA 01,01,01,01,01,01,04,04,14
19700 DATA 01,01,01,01,01,01,01,01,8
19710 DATA 01,01,01,01,01,01,01,01,8
19720 DATA 01,01,04,04,01,01,00,00,12
19730 DATA 00,01,00,00,00,01,00,00,2
19740 DATA 00,01,00,00,00,01,04,04,10
19750 DATA 01,01,00,00,0B,01,00,00,14
19760 DATA 0B,01,0B,00,00,01,00,03,27
19770 DATA 0B,01,04,04,01,01,00,03,25
19780 DATA 00,01,03,00,00,01,00,00,5
19790 DATA 03,01,00,00,00,01,04,04,13
19800 DATA 01,01,01,01,01,01,01,01,8
19810 DATA 01,01,01,01,01,01,01,01,8
19820 DATA 01,01,04,04,01,00,00,00,11
19830 DATA 01,01,00,00,01,01,00,00,4
19840 DATA 03,01,01,04,01,01,04,04,19
19850 DATA 01,00,0B,00,00,00,00,0B,23
19860 DATA 01,01,0B,01,00,01,04,04,23
19870 DATA 04,01,04,04,01,03,00,00,17
19880 DATA 01,01,00,00,01,01,00,00,4
19890 DATA 00,01,01,04,01,01,04,04,16
19900 DATA 01,01,01,01,01,01,01,01,8
19910 DATA 01,01,01,01,01,01,01,04,11
19920 DATA 01,01,04,04,04,04,04,04,26
19930 DATA 04,04,04,04,04,04,04,04,32
19940 DATA 04,04,04,04,04,04,04,04,32
19950 DATA 03,03,02,01,01,06,01,01,18
19960 DATA 01,01,02,01,02,01,01,01,10
19970 DATA 02,02,04,04,03,02,01,01,19
19980 DATA 01,04,04,03,04,01,01,01,19
19990 DATA 02,01,01,01,02,02,04,04,17
20000 DATA 02,01,01,01,04,01,02,01,13
20010 DATA 01,04,01,01,02,01,02,01,13
20020 DATA 01,03,04,04,01,01,02,04,20
20030 DATA 04,03,02,01,01,03,04,04,22
20040 DATA 01,01,02,01,01,03,04,04,17
20050 DATA 01,01,02,04,04,04,04,01,21
20060 DATA 04,04,04,04,01,01,03,01,22
20070 DATA 01,01,04,04,00,00,04,01,15
20080 DATA 01,01,01,03,01,03,02,03,15
20090 DATA 04,01,01,01,01,01,04,04,17
20100 DATA 00,04,04,01,02,01,01,02,15
20110 DATA 01,02,03,02,04,04,01,01,18
20120 DATA 02,01,04,04,03,04,01,01,20
20130 DATA 02,02,01,02,01,01,01,01,11
20140 DATA 03,04,01,01,02,01,04,04,20
20150 DATA 04,04,04,04,04,04,04,04,32
20160 DATA 04,04,04,04,04,04,04,01,29
20170 DATA 01,01,04,04,01,01,01,03,16
20180 DATA 00,00,00,00,08,00,03,01,12
20190 DATA 01,01,01,01,01,01,04,04,14
20200 DATA 04,04,04,04,04,04,04,04,32
20210 DATA 04,04,04,04,04,04,04,04,32
20220 DATA 04,04,04,04,02,02,02,02,24
20230 DATA 02,02,01,02,02,02,02,02,15
20240 DATA 02,02,02,02,02,02,04,04,20
20250 DATA 02,01,01,01,01,01,01,01,9
20260 DATA 02,02,02,02,02,01,01,01,13
20270 DATA 01,01,04,04,01,01,01,03,16
20280 DATA 02,03,01,01,01,02,02,02,14
20290 DATA 01,01,01,01,01,01,04,04,14
20300 DATA 01,01,01,01,01,01,01,01,8
20310 DATA 01,01,01,01,01,01,01,01,8
20320 DATA 01,01,04,04,01,01,01,01,14
20330 DATA 01,01,01,01,01,01,01,01,8
20340 DATA 06,01,01,01,01,01,04,04,19
20350 DATA 01,01,04,04,04,04,04,04,26
20360 DATA 04,04,04,04,04,04,04,01,29
20370 DATA 01,01,04,04,01,04,03,0B,29
20380 DATA 0B,00,0B,00,0B,0B,0B,0B,66
20390 DATA 0B,0B,00,01,01,01,04,04,33
20400 DATA 01,01,04,02,02,02,02,02,16
20410 DATA 02,02,02,02,02,02,02,01,15
20420 DATA 01,01,04,04,01,01,01,01,14
20430 DATA 01,01,01,01,01,01,01,01,8
20440 DATA 01,01,01,01,01,01,04,04,14
20450 DATA 02,04,04,04,01,01,04,01,21
20460 DATA 01,04,01,01,04,04,02,02,19
20470 DATA 01,01,04,04,04,04,04,04,26
20480 DATA 04,04,04,04,04,04,04,04,32
20490 DATA 04,04,04,04,04,04,04,04,32
20500 DATA 03,00,0B,00,01,01,02,02,20
20510 DATA 02,02,02,01,01,00,00,0B,19
20520 DATA 00,03,04,04,04,04,04,04,27
20530 DATA 01,04,01,02,03,02,01,04,18
20540 DATA 01,04,04,04,04,04,04,04,29
20550 DATA 03,00,00,00,01,01,04,0B,20
20560 DATA 02,01,04,01,01,00,00,00,9
20570 DATA 00,03,04,04,04,04,04,04,27
20580 DATA 01,01,04,01,01,01,04,01,14
20590 DATA 01,04,04,04,04,04,04,04,29
20600 DATA 03,0B,00,00,01,01,04,04,24
20610 DATA 01,04,04,01,01,0B,00,00,22
20620 DATA 00,03,04,04,04,04,04,04,27
20630 DATA 01,01,01,01,01,01,01,01,8
20640 DATA 01,04,04,04,04,04,04,04,29
20650 DATA 03,00,00,00,01,01,01,01,7
20660 DATA 06,01,01,01,01,00,03,00,13
20670 DATA 00,03,04,04,04,04;04,04,27
20680 DATA 01,01,01,01,01,01,01,01,8
20690 DATA 01,04,04,04,04,04,04,04,29
20700 DATA 00,0B,00,03,01,01,01,01,18
20710 DATA 01,01,01,01,01,00,00,00,5
20720 DATA 00,00,04,04,03,01,01,00,13
20730 DATA 01,01,01,01,01,01,01,01,8
20740 DATA 01,01,00,03,00,00,04,04,13
20750 DATA 04,04,04,04,04,04,04,04,32
20760 DATA 04,04,04,04,04,04,04,04,32
20770 DATA 04,04,04,04,01,01,01,01,20
20780 DATA 01,01,04,04,04,04,01,01,20
20790 DATA 01,01,02,02,02,01,04,04,17
20800 DATA 01,01,02,01,01,04,01,03,14
20810 DATA 02,03,04,01,01,01,03,03,18
20820 DATA 03,01,04,04,01,02,01,01,17
20830 DATA 04,01,01,01,02,01,01,04,15
20840 DATA 01,01,02,02,02,01,04,04,17
20850 DATA 02,01,01,01,04,03,01,01,14
20860 DATA 03,01,01,04,01,01,01,01,13
20870 DATA 01,01,04,04,03,01,01,01,16
20880 DATA 01,04,01,01,01,01,04,01,14
20890 DATA 01,03,01,01,03,01,04,04,18
20900 DATA 01,02,01,01,01,01,02,04,13
20910 DATA 04,02,01,01,01,01,02,02,14
20920 DATA 02,01,04,04,01,03,01,01,17
20930 DATA 01,01,02,02,02,02,01,01,12
20940 DATA 01,01,02,03,03,01,04,04,19
20950 DATA 03,02,01,01,06,01,01,02,17
20960 DATA 02,01,01,01,01,01,02,01,10
20970 DATA 01,02,04,04,03,03,01,01,19
20980 DATA 01,01,01,01,01,01,00,01,7
20990 DATA 01,01,01,01,01,01,04,04,14
21000 DATA 01,01,01,01,01,01,01,01,8
21010 DATA 01,01,00,00,0B,00,01,01,15
21020 DATA 03,03,04,04,04,04,04,04,30
21030 DATA 04,04,04,04,04,04,04,04,32
21040 DATA 04,04,04,04,04,04,04,04,32
21050 DATA 01,01,01,01,06,01,01,01,13
21060 DATA 01,01,01,01,01,01,01,01,8
21070 DATA 01,01,04,04,04,04,04,04,26
21080 DATA 04,04,04,01,04,04,04,01,26
21090 DATA 01,01,01,01,01,01,04,04,14
21100 DATA 01,01,01,01,01,01,01,01,8
21110 DATA 01,01,04,01,01,01,01,01,11
21120 DATA 01,01,04,04,00,04,01,04,19
21130 DATA 04,04,01,04,04,01,04,01,23
21140 DATA 01,01,01,01,01,01,04,04,14
21150 DATA 0B,04,01,01,02,01,01,01;22
21160 DATA 04,01,04,01,01,01,01,01,14
21170 DATA 01,01,04,04,0B,04,01,04,30
21180 DATA 04,01,04,01,04,00,04,01,19
21190 DATA 01,01,01,01,01,01,04,04,14
21200 DATA 03,04,01,04,00,00,04,01,17
21210 DATA 04,00,04,01,01,01,01,01,13
21220 DATA 01,01,04,04,03,04,03,04,24
21230 DATA 00,0B,04,00,04,0B,04,01,35
21240 DATA 01,01,01,01,01,01,04,04,14
21250 DATA 03,04,03,04,00,00,04,0B,29
21260 DATA 04,00,04,01,01,01,01,01,13
21270 DATA 01,01,04,04,0B,04,0B,04,40
21280 DATA 03,00,04,0B,04,03,04,01,30
21290 DATA 01,01,01,01,01,01,04,04,14
21300 DATA 04,04,04,04,04,04,04,04,32
21310 DATA 04,04,04,04,04,04,04,04,32
21320 DATA 04,04,04,04,02,04,01,01,24
21330 DATA 01,01,01,01,01,01,02,02,10
21340 DATA 01,01,01,01,01,01,04,04,14
21350 DATA 03,01,01,01,01,01,06,01,15
21360 DATA 01,01,01,01,01,01,01,01,8
21370 DATA 01,01,04,04,01,04,04,04,23
21380 DATA 04,04,04,00,04,04,04,02,26
21390 DATA 02,04,01,01,01,01,04,04,18
21400 DATA 01,04,00,00,00,00,00,00,5
21410 DATA 00,00,00,01,01,04,01,01,8
21420 DATA 01,01,04,04,01,04,00,04,19
21430 DATA 04,04,04,00,04,04,04,04,28
21440 DATA 00,04,04,01,04,04,04,04,25
21450 DATA 03,04,01,04,0B,00,00,00,23
21460 DATA 00,00,00,04,00,04,0B,00,19
21470 DATA 00,00,04,04,01,04,00,04,17
21480 DATA 03,04,04,04,04,04,03,04,30
21490 DATA 00,04,00,01,01,00,04,04,14
21500 DATA 01,01,00,04,03,04,00,00,13
21510 DATA 00,00,03,04,00,04,00,01,12
21520 DATA 01,00,04,04,04,04,00,04,21
21530 DATA 04,04,04,00,04,04,04,04,28
21540 DATA 00,04,00,00,00,0B,04,04,23
21550 DATA 03,03,00,00,00,00,00,00,6
21560 DATA 0B,00,00,00,00,04,04,04,23
21570 DATA 04,03,04,04,04,04,04,04,31
21580 DATA 04,04,04,04,04,04,04,04,32
21590 DATA 04,04,04,04,04,04,04,04,32
21600 DATA 01,01,01,01,01,01,01,02,9
21610 DATA 02,02,02,02,01,01,01,01,12
21620 DATA 01,01,04,04,01,01,01,01,14
21630 DATA 01,01,01,01,01,01,01,01,8
21640 DATA 01,01,01,01,01,01,04,04,14
21650 DATA 01,01,01,01,06,01,01,01,13
21660 DATA 01,01,01,01,01,01,01,01,8
21670 DATA 01,01,04,04,04,04,04,04,26
21680 DATA 04,04,04,01,01,01,01,01,17
21690 DATA 04,04,04,01,01,01,04,04,23
21700 DATA 04,00,00,08,00,00,00,00,12
21710 DATA 00,00,00,00,00,00,04,01,5
21720 DATA 01,01,04,04,04,04,04,04,26
21730 DATA 04,04,04,04,04,04,04,00,28
21740 DATA 04,04,04,01,01,01,04,04,23
21750 DATA 01,01,01,01,04,0B,0B,0B,41
21760 DATA 0B,0B,04,01,01,01,01,01,31
21770 DATA 01,01,04,04,01,01,01,01,14
21780 DATA 04,00,00,00,01,00,04,00,9
21790 DATA 00,00,00,00,00,01,04,04,9
21800 DATA 01,01,01,01,04,00,01,00,9
21810 DATA 00,00,04,00,01,01,01,01,8
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SUPERCHARGE

SUPERPOWER SIDEWAYS ROM CARD (Ref A101)

This unit opens up a whole new field of personal computing, previously only available to owners of the BBC Micro and other top of the range computers.

The SUPERPOWER Sideways Rom Card has the following features:

- Matching case, with easily detachable cover.
- Fits snugly to rear of computer.
- Bus extension for fitting of Disk Interface etc.
- Houses up to 7 Roms. (Foreground, Background & Extension).
- Any mix of 8K or 16K Eproms.
- No additional power supply necessary.

SUPERPOWER ROM BASED SOFTWARE

CURRENTLY AVAILABLE:

Programmer's Toolbox; Disk User's Utilities; Mailing List & Club Membership; Assembler, Disassembler & Machine-code Monitor.

COMING SOON:

Word Processor; Database....SEPTEMBER
Spreadsheet; Graphics/Statistics....OCTOBER

Rom-based Software has the following important advantages:—

1. Written in machine-code, it is very fast in operation.
2. Programs are instantly available from the keyboard.
3. The program code does not use RAM, thus permitting much larger files to reside in memory, reducing the number of disk accesses and saving time when manipulating files.
4. The program itself cannot become corrupted.

SUPERPOWER DISK USER'S UTILITIES (Ref A103)

Program allows detailed inspection and modification of information held on disk and is of particular use for recovering data from corrupted disks. Individual sectors can be read from and written to. All data can be output to the screen and/or printer. Program also contains a number of functions of use to assembly language programmers.

TABULATE DIRECTORY: Displays directory and enters EDIT mode. READ DISK SECTOR: Read sector and enter EDIT mode. LOAD DISK FILE: Load first sector into buffer and remainder to memory for fast access. Enter EDIT mode. LOAD UPPER ROM: Catalogues resident roms, prompts for rom selection and enters EDIT mode. EDIT MEMORY: Displays current buffer. Data displayed is Buffer Address, Hex and ASCII. Comprehensive editing facilities. 'COPY' key gives Intelligent Data Copy. 'TAB' key gives printer output. WRITE: Write sector to disk. DISASSEMBLE: Disassembles code from specified address, giving address, object code, menmonics and ASCII. Screen and/or Printer output. SEARCH MEMORY: Search sector or a complete file for ASCII string or series of Hex codes. UTILITIES: Includes Format, Hex/Decimal conversions, jump calculations etc.

SCREEN UTILITIES: Select from four display modes; choose background and foreground colours.

SUPERPOWER SIDEWAYS ROM CARD (Ref A101)



SUPERPOWER MAILING LIST AND CLUB MEMBERSHIP PROGRAM (Ref A102)

Program handles thousands of name and address records (label and non-label fields). Twenty classification indicators make possible sophisticated selective examination, counting and printing of records. Alphabetical order is dealt with on data entry, allowing user to select 'key' word. Works with single and double disks as well as cassette.

Main Commands ...
ENTER: Data entry(*) GET: Load new file. COUNT: Selective Count. FIND: Find 'Name' or any String(*). LIST: List current file on screen (*). PRINT: Print label data or whole records selectively. MERGE: Merge and Sort files. SAVE: Write a file to disk or cassette. RESET: Reset colours, label sizes, class definitions, string constants etc. (*Editing facilities available).

SUPERPOWER ASSEMBLER, DISASSEMBLER & MACHINE-CODE MONITOR (Ref A105)

This suite of routines represents the complete Development Package for the Amstrad Z80 programmer.

The assembler has a sophisticated text editor, a comprehensive set of options, is very fast and incorporates special techniques enabling large source files to be handled in memory. The full-feature disassembler produces files which can be edited and then re-assembled. The Machine-code Monitor routines are extremely powerful, including the setting of conditional breakpoints (including loop counter option), single-step execution, alternative five column binary and mnemonic formats. Both sets of Z80 registers can be displayed. Other options include Intelligent Move, Modification of code to run at a new address and colour selection of border, paper and pen.

SUPERPOWER PROGRAMMER'S TOOLBOX for the CPC 464 (Ref A104)

ADDITIONAL BASIC

TURTLE: Logo-like turtle graphics. TUNE: Output music string. CIRCLE: Draw a circle. FILL: Fill an area surrounded by foreground colour. GRAPHICS PEN/GRAPHICS PAPER: Set graphics and background colours. COPYCHR: Read a screen charter. ECHO ON/ECHO OFF: Printer output on and off. PAGE ON/PAGEOFF: Paged screen output on and off. CLEAR INPUT:— clear input buffer. (+extra graphics commands).

PROGRAMMER'S AIDS

EDITOR: Gives 2 additional windows for program editing. FIND (& REPLACE): Find a string and optionally replace. XREF: List references to particular line numbers (GOTO's, GOSUB's etc). COMPACT: Remove REM statements. FRAME: Synchronise screen update with frame fly-back. PRINTER: Epson-compatible or Amstrad printer for dump routines. FDUMP: Fast two-tone screen dump, with user-definition of 'pen' and 'paper'. CDUMP: Shaded screen dump depicting up to 9 colours. PLOAD: Load program saved under 'P' option. INFO: Give details on specified disk file. MEDIT: Comprehensive HEX and ASCII memory editor. LTRON (LTROFF): Send TRACE output to printer. HELP: List commands, functions and their parameters.

ROM-BASED SOFTWARE FULFILS THE PROM

YOUR AMSTRAD.

SUPERPOWER WORD PROCESSOR (Ref A106)

This program incorporates the most useful facilities offered by the best Word Processors currently available on the BBC Micro and other up-market Home Computers.

Text Entry/Editing. User choice of 40 or 80 column mode. Document formatting achieved through use of embedded commands. Text can be formatted and justified on screen, if required. Find <and Replace>with 'wild-card' option. Word count, character count and page numbering reported.

Formatting. Multiple rulers are provided, allowing sophisticated layout of documents e.g. different combinations of TAB stops at different points in the text. All the normal controls are available e.g. page lengths & width, margins, indents, tab stops, justification, headers, footers etc., together with output of control characters to the printer.

Virtually UNLIMITED Document Length. The disk routines in the program handle multiple data files representing parts of a total document, with loading and saving carried out automatically.

Simple Calculator. A calculator window can be called to carry out simple arithmetic calculations. It is also possible to embed a calculation in the text, with the result being calculated and printed on output.

Data Exchange. As part of an integrated suite, the program will be able to handle ASCII files originating from the Spreadsheet, Database and Graphics/Statistics Packages.

Disk/External Commands. Direct Access available.

MANY MORE FEATURES. Ask your dealer for information.

SUPERPOWER DATABASE (Ref A107)

This menu-driven program has been designed to be the most comprehensive and flexible Database which can be achieved in 16K of machine code. Of special note are the PROCEDURES which have been implemented, enabling the more advanced user to write simple structured programs to manipulate the database information in order to meet his more specialized requirements. Databases need not be limited in size since the program contains routines for multiple file handling.

Field types — alphanumeric, integer, currency, floating point, logic, calculated and date.

MAIN FILE COMMANDS
— Create/Modify database structures, reports and procedures.
— Create ASCII file from a Database, enabling data to be passed to the Word Processor, Spreadsheet and Graphic/Statistics programs.
— Copy data to new Database.

RECORD EDITING
— Add, amend, delete, insert, view and duplicate.
— Search and Sort. Due to intelligent file structure and the indexing system adopted, both SEARCH and SORT are extremely fast.

REPORTS
Standard — selected fields may be output, together with totalling on those nominated. (Value fields only). Screen or printer output.
Labels — user-selected fields for printing. User-defined label size, number on sheet etc.
User-defined — user created report-format, combining entered text and designated fields. Editing and storing facilities.

SUPERPOWER ADVICE CENTRES

AVON
K & K Computers, Weston Super Mare 0934 419324.

BEDFORDSHIRE
Chiltern Computers Luton 0582 455684.
Hobbyte Limited Luton 0582 457195.
Zedem Computers Bedford 0234 213645.
DJ Computers Leyton Buzzard 0525 383929.

BERKSHIRE
Gadgets Windsor 07535 67211.

CHESHIRE
Northern Computers Frodsham 0928 35110.
Pyramid Micros Warrington 0925 35713.

CLEVELAND
Multicoloured Micro Shop Redcar 0642 486643.

DEVON
Computerbase Plymouth 0752 672128.
Computer Systems (Torbay) Paignton 0803 524284.
Georges Booksellers Exeter 0392 71072.
Georges Booksellers Plymouth 0752 661011.
Computerware Exeter 0392 210507.
Syntax Limited Plymouth 0752 28705.
Seven Counties Exeter 0392 211211.

DORSET
Seven Counties Dorchester 0305 66022.
Lansdowne Computer Centre Poole 0202 670901
Lansdowne Computer Centre Bournemouth 0202 290165

EIRE
Bit by Bit Bray 001 868 541.

ESSEX
Clarke Coyston Computers Southend-on-Sea 0702 337161.
Estuary Personal Computers Southend-on-Sea 0702 614131.
Computerama Southend-on-Sea 0702 335443.
Colchester Computers Colchester 0206 47242.
Mirage Microcomputers Braintree 0376 48321.
Computer Centre Hornchurch 04024 75613

GLOUCESTERSHIRE
Screen Scene Cheltenham 0242 528979.

HAMPSHIRE
Electronequip Fareham 0329 230671.
Alton Computers Alton 0420 87998.
Timatic Systems Fareham 0329 236727.

HERTFORDSHIRE
DJ Computers Stevenage 0438 65501
DJ Computers Welwyn Garden City 0707 328435.
Hobbyte Ltd. St. Albans 0727 41396

HUMBERSIDE
Computing World Beverley 0482 881831.

ISLE OF WIGHT
V M S Computer Centre Newport 0983 525450.

KENT
The Village House of Computers Bromley 01 460 7122.
Microway Computers Rainham 0634 376702.
Marlowe Micros Canterbury 0227 453531.
Adventurer's Guild Gravesend 0474 334008.
Numbus Computing West Wickham 01 777 3160.
MD Micros Crayford 0322 524123.

LANCASHIRE
Computer World Bolton 0204 494304.
I M O Computers Burnley 0282 54299.
4MAT Computing Ltd. Preston 0772 561952

LONDON
Adams World of Software London N12 01 446 7170.
Colmore & Microtanic Dulwich SE22 01 299 1419.
Vic Oddens London SE1 01 403 1988.
Computers Inc. London NW11 01 209 0401.
G & B Computers London W1 01 580 3702.

LINCOLNSHIRE
M K D Computers Lincoln 0522 25907.

MANCHESTER
Mighty Micro Fallowfield 061 224 8117.
Celcom Systems Manchester 061 834 2808.

MERSEYSIDE
MicroByte Wallasey 051 6306933.
Hargreaves Computers Liverpool 051 525 1782.

MIDDLESEX
HB Computer Sales Ashford 07842 56416
J K L Computers Uxbridge 0895 51815.
Screens Microcomputers Northwood 09274 20664.
Trionic Limited Harrow 01 861 0036.

NORFOLK
Abacus Norwich 0603 614441.
Thetford Micros Thetford 0842 61645.

NORTHERN IRELAND
Botanic Computer Centre Belfast 0232 240798.

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Alnwick Computers The Market Place Alnwick 0665 604816.

NOTTINGHAM
G A Computers Ruddington 0602 211225.
Computer Market Nottingham 0602 586454.
S P Electronics Nottingham 0602 640377

SCOTLAND
Micro Mart Kirkcaldy 0592 206251.

SOMERSET
The Forum Chard 04606 5009.

STAFFORDSHIRE
Leek Computer Centre Leek 0538 387859.
Computer Cabin Newcastle under Lyne 0782 636911.
Town Computer Centre Stoke on Trent 0782 287540.

SURREY
Computerama Burgh Heath 07373 54717.
Computersolve Surbiton 01 390 5135.
Micro Workshop Epsom 03727 21533.

SUSSEX
Gamer Brighton 0273 698424.
Computermania Chichester 0243 779263.
Computermania Littlehampton 0903 716187.

TYNE AND WEAR
Sunderland Computer Centre Sunderland 0783 655711/655736.

WALES
Cardigan Electronics Cardigan 0239 614483.
Bucon Limited Swansea 0792 467980.
Teleview Neath 0639 53282.
Cwmbran Computer Centre Cwmbran 06333 60996.

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O E M Computer Systems Rugby 0788 70522.
Micro City Nuneaton 0203 382049.

WILTSHIRE
Barbury Computers Swindon 0793 611487.
Trowbridge Computer Shack Trowbridge 02214 67299
West Wiltshire Micros Trowbridge 02214 62759

YORKSHIRE
Micro Power Leeds LS2 0532 458800.

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HOW TO ORDER

Phone or write to: The SuperPower Project Office, Micro Power Ltd., Northwood House, North Street, Leeds LS7 2AA. TELEPHONE (0532) 434006.

SUPER POWER

SERIOUS SOFTWARE FROM THE MICROPOWER ORGANISATION

SE OF YOUR AMSTRAD.

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21820 DATA 00,01,04,04,01,01,01,01,13
21830 DATA 04,00,00,00,00,01,04,03,12
21840 DATA 00,00,00,00,0B,01,04,04,20
21850 DATA 04,04,04,04,04,04,04,04,32
21860 DATA 04,04,04,04,04,04,04,04,32
21870 DATA 04,04,04,04,01,01,01,01,20
21880 DATA 01,01,01,01,01,01,01,01,8
21890 DATA 01,01,01,01,02,01,04,04,15
21900 DATA 01,03,01,04,01,03,01,01,15
21910 DATA 01,02,02,02,01,01,01,02,12
21920 DATA 03,02,04,04,01,01,03,04,22
21930 DATA 03,01,01,01,01,01,02,02,12
21940 DATA 02,03,01,01,02,01,04,04,18
21950 DATA 01,04,04,04,04,04,01,01,23
21960 DATA 01,01,03,02,02,02,01,01,13
21970 DATA 01,01,04,04,01,01,03,04,19
21980 DATA 03,01,01,01,02,01,03,02,14
21990 DATA 02,02,02,01,01,01,04,04,17
22000 DATA ***
```



Program 7

```
6 PRINT"program 7 is running":PRINT"Work
  ing on line"
10 valid$="0123456789ABCDEF":ln=22000
20 x=37560
30 FOR y=0 TO 7
40 READ num$:IF num$="***" THEN 110
50 IF INSTR(valid$,LEFT$(num$,1)) OR INS
   TR (valid$,RIGHT$(num$,1)) THEN num=V
   AL("&"+num$):POKE x+y,num ELSE 120
60 chk=chk+num
70 NEXT:ln=ln+10
80 READ check:IF chk<>check THEN 130
90 chk=0
95 PRINT ln;CHR$(11)
100 x=x+8:GOTO 30
110 PRINT"bytes=";x+y
115 STOP:'CALL &BD19:CALL 21760
120 PRINT"Invalid character in line ";ln
    :END
130 PRINT"Checksum error in line ";ln:EN
    D
22000 DATA 01,03,01,04,01,03,01,02,16
22010 DATA 03,01,03,02,03,02,01,01,16
22020 DATA 01,01,04,04,01,01,01,01,14
22030 DATA 01,01,01,01,02,01,02,02,11
22040 DATA 02,03,01,06,01,02,04,04,23
22050 DATA 01,01,01,01,01,01,01,01,8
22060 DATA 01,02,02,02,03,01,01,01,13
22070 DATA 02,03,04,04,01,02,02,02,20
22080 DATA 01,01,01,01,01,01,01,01,8
22090 DATA 01,01,01,02,03,03,04,04,19
22100 DATA 02,03,03,03,03,02,02,01,19
```

```
22110 DATA 01,01,01,01,01,01,01,03,10
22120 DATA 03,03,04,04,04,04,04,04,30
22130 DATA 04,04,04,04,04,04,04,04,32
22140 DATA 04,04,04,04,04,04,04,04,32
22150 DATA 01,02,02,02,01,01,02,01,12
22160 DATA 02,02,02,01,01,01,01,06,16
22170 DATA 01,01,04,04,01,02,01,03,17
22180 DATA 01,01,02,01,02,01,01,01,10
22190 DATA 01,02,01,01,01,01,04,04,15
22200 DATA 01,02,03,03,01,02,02,01,15
22210 DATA 02,02,01,03,01,03,01,02,15
22220 DATA 02,01,04,04,01,02,01,01,16
22230 DATA 01,02,01,00,02,01,01,01,9
22240 DATA 01,02,03,01,01,01,04,04,17
22250 DATA 01,02,02,02,01,02,01,08,19
22260 DATA 02,00,0B,00,00,01,01,01,16
22270 DATA 01,01,04,04,01,04,04,04,23
22280 DATA 01,04,04,04,01,02,02,02,20
22290 DATA 00,04,04,04,01,01,04,04,22
22300 DATA 01,01,01,04,01,04,03,04,19
22310 DATA 01,02,08,02,01,01,03,04,22
22320 DATA 01,01,04,04,01,03,04,04,22
22330 DATA 01,01,01,04,01,02,02,02,14
22340 DATA 01,04,04,04,01,01,04,04,23
22350 DATA 01,03,08,04,01,04,0B,04,36
22360 DATA 01,02,03,02,01,01,03,04,17
22370 DATA 01,01,04,04,01,04,04,04,23
22380 DATA 01,04,04,04,01,02,02,02,20
22390 DATA 00,04,04,04,01,01,04,04,22
22400 DATA 04,04,04,04,04,04,04,04,32
22410 DATA 04,04,04,04,04,04,04,04,32
22420 DATA 04,04,04,04,02,03,03,02,26
22430 DATA 02,04,03,03,03,04,04,02,25
22440 DATA 02,02,01,02,03,01,04,04,19
22450 DATA 02,03,03,02,01,03,03,03,20
22460 DATA 03,03,02,01,01,01,01,02,14
22470 DATA 03,01,04,04,01,02,02,01,18
22480 DATA 01,01,02,03,02,02,01,01,13
22490 DATA 06,01,01,02,03,01,04,04,22
22500 DATA 01,01,04,01,01,01,01,02,12
22510 DATA 02,01,01,01,01,01,01,02,10
22520 DATA 03,01,04,04,01,01,01,01,16
22530 DATA 01,01,01,01,01,01,01,01,8
22540 DATA 01,01,01,01,01,01,04,04,14
22550 DATA 00,00,00,00,00,00,00,00,0
22560 DATA 00,01,01,04,04,04,04,04,22
22570 DATA 04,04,04,04,01,01,01,01,20
22580 DATA 01,01,01,01,0B,00,01,04,20
22590 DATA 0B,0B,0B,0B,03,03,04,04,58
22600 DATA 02,00,02,00,01,00,00,01,6
22610 DATA 01,00,01,04,03,03,03,03,18
22620 DATA 03,03,04,04,01,00,01,08,24
22630 DATA 01,00,00,00,01,00,01,04,7
22640 DATA 03,03,03,03,03,03,04,04,26
22650 DATA 02,08,01,00,01,00,0B,03,26
22660 DATA 01,00,01,04,03,03,0B,03,26
22670 DATA 03,03,04,04,04,04,04,04,30
22680 DATA 04,04,04,04,04,04,04,04,32
22690 DATA 04,04,04,04,04,04,04,04,32
22700 DATA 03,01,01,01,01,01,00,00,8
22710 DATA 00,00,00,00,00,00,00,00,0
22720 DATA 00,00,04,04,01,0B,0B,0B,42
22730 DATA 00,00,00,00,04,04,04,00,12
22740 DATA 06,00,00,00,00,00,04,04,14
22750 DATA 01,0B,01,01,01,04,00,00,19
22760 DATA 00,04,00,00,00,00,00,00,4
22770 DATA 00,00,04,04,01,0B,0B,0B,42
22780 DATA 01,04,00,00,00,04,00,04,13
22790 DATA 04,00,00,00,00,00,04,04,12
22800 DATA 01,01,01,0B,01,04,03,03,25
22810 DATA 02,04,00,04,03,02,03,04,22
22820 DATA 00,00,04,04,01,0B,0B,0B,42
22830 DATA 03,04,04,04,02,00,00,04,21
22840 DATA 03,04,03,04,0B,00,04,04,33
22850 DATA 01,01,01,03,01,03,01,02,13
22860 DATA 01,02,00,04,04,04,04,04,23
```

```
22870 DATA 00,00,04,04,00,00,01,03,12
22880 DATA 03,03,01,02,02,02,0B,00,24
22890 DATA 00,04,0B,04,00,00,04,04,27
22900 DATA 00,00,01,03,01,01,01,02,9
22910 DATA 01,02,01,00,00,04,00,04,12
22920 DATA 00,00,04,04,00,00,00,03,11
22930 DATA 00,00,00,02,01,02,03,00,8
22940 DATA 00,00,00,00,00,00,04,04,8
22950 DATA 04,04,04,04,04,04,04,04,32
22960 DATA 04,04,04,04,04,04,04,04,32
22970 DATA 04,04,04,04,02,0B,03,02,34
22980 DATA 01,01,01,01,0B,01,01,01,18
22990 DATA 01,01,02,01,01,01,04,04,15
23000 DATA 03,02,02,01,01,01,01,01,12
23010 DATA 01,01,01,01,01,02,01,01,9
23020 DATA 03,02,04,04,02,01,01,01,18
23030 DATA 01,01,01,04,00,04,04,04,19
23040 DATA 04,04,04,04,01,01,04,04,26
23050 DATA 02,01,01,04,04,04,04,00,20
23060 DATA 00,00,00,00,00,00,00,04,4
23070 DATA 02,02,04,04,01,01,04,00,18
23080 DATA 00,00,00,00,00,04,00,04,8
23090 DATA 00,00,0B,04,01,01,04,04,25
23100 DATA 03,04,00,00,04,04,04,04,23
23110 DATA 04,04,00,04,00,04,04,04,24
23120 DATA 02,01,04,04,04,00,00,04,19
23130 DATA 00,00,00,00,00,00,00,04,4
23140 DATA 00,00,03,04,01,01,04,04,17
23150 DATA 04,00,04,00,00,04,04,04,20
23160 DATA 04,04,04,04,04,04,01,04,29
23170 DATA 01,01,04,04,00,00,04,00,14
23180 DATA 00,04,01,01,03,03,00,02,14
23190 DATA 01,00,00,00,01,01,04,04,11
23200 DATA 03,03,04,0B,0B,04,01,01,38
23210 DATA 03,02,0B,01,01,01,01,06,26
23220 DATA 01,01,04,04,04,04,04,04,26
23230 DATA 04,04,04,04,04,04,04,04,32
23240 DATA 04,04,04,04,04,04,04,04,32
23250 DATA 04,00,00,00,00,00,00,00,4
23260 DATA 00,06,00,00,00,00,00,04,10
23270 DATA 00,00,04,04,04,00,00,04,16
23280 DATA 04,04,04,04,00,04,04,04,28
23290 DATA 04,00,00,04,03,03,04,04,22
23300 DATA 04,00,04,0B,00,00,00,00,19
23310 DATA 00,00,00,00,00,04,00,04,8
23320 DATA 01,01,04,04,04,00,00,04,18
23330 DATA 04,04,04,00,00,04,04,04,24
23340 DATA 04,04,00,04,01,01,04,04,22
23350 DATA 04,04,00,00,04,04,04,00,20
23360 DATA 00,04,00,04,04,00,00,04,16
23370 DATA 02,01,04,04,03,04,00,00,18
23380 DATA 04,00,0B,00,00,00,00,00,15
23390 DATA 04,00,04,01,01,01,04,04,19
23400 DATA 01,00,00,00,04,04,04,04,17
23410 DATA 00,04,04,04,04,00,04,02,22
23420 DATA 01,02,04,04,00,00,00,04,15
23430 DATA 0B,0B,0B,0B,00,00,00,00,44
23440 DATA 08,00,04,02,01,02,04,04,25
23450 DATA 08,08,08,08,04,04,04,04,48
23460 DATA 00,00,04,04,04,04,04,02,22
23470 DATA 01,02,04,04,03,03,0B,0B,39
23480 DATA 04,03,00,00,00,00,00,00,7
23490 DATA 00,00,01,01,01,01,04,04,12
23500 DATA 04,04,04,04,04,04,04,04,32
23510 DATA 04,04,04,04,04,04,04,04,32
23520 DATA 04,04,00,00,00,00,00,00,8
23530 DATA 00,00,00,00,00,00,00,00,0
24050 DATA ***
```



ACU !!!

Amstrad Business Computing

The supplement for Amstrad Business Computer Users

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December 1985
Volume one
Number one

Inside:

Update:

Advice for new PCW8256 owners:
Copying and formatting troubles resolved
Selecting software



Upgrades

It's never too early to think ahead....

Wordprocessing

All about NewWord, the WordStar upgrade?

First issue

Not Necessarily Business as Usual

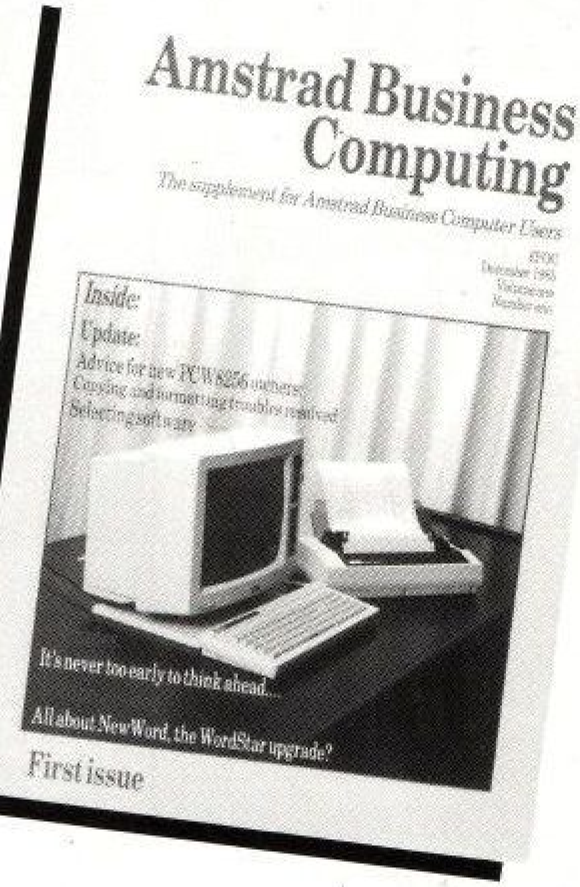
William Poel **Amstrad Business Editor**

We decided to operate a separate business computing section with this issue. After all, business and pleasure don't necessarily mix, particularly when our analysis of new owners of the PCW8256 reveals a distinct tendency towards the commercial rather than the personal. There's a great wealth of talent within the ambit of this magazine on all topics of interest to our readers, so it seems sensible to start to organise a more departmental approach.

It also allows more scope for the rest of this magazine to maybe let its hair down just a shade more now that the entertainment software being produced for the system is actually something to get excited about. Most 464/6128 owners are still proving to be second generation computer owners, and so our readership is still the most sophisticated and knowledgable in the home computer marketplace. Anyone checking out the attendance of the recent Amstrad Computer User show cannot fail to agree.

However, we will try our best to keep our writers away from the lure of the Evo-Stik - and the local playgroup away from our art department.....

So, lots of letters correctly identified to ABC please. We are going to run a business computing section with effect from the next issue: and remember, only letters accompanied by an SAE can be answered, and only programs supplied on disc can be reviewed.



ABC REVIEW

The New Pretender

With the PCW8256 wowing the WP market, why bother about another WP program? Well, simple really, if you want to talk to an external printer or edit program files, or run a spell check then LocoScript won't deliver. And if you own a CPC6128, then you may be on the look out for a macho wordprocessor program that offers the power and promise of full CPM80. NewWord looks like it fits the bill on all scores.

The Real Things

Just as Coca-Cola got the jitters a while ago and felt it had to revamp up its image and produce a new formula product, so MicroPro felt that WordStar had served long enough to warrant a replacement. The result of the Coke exercise was that well publicised fiasco resulting in the original product being re-issued as Coca-Cola classic.

Try as they may, MicroPro have found that the world's favourite word processing program refuses to lie down quietly and be buried by WordStar 2000. Bearing in mind that WordStar 2000 only runs effectively on an IBM PC or clone with a hard disc, and doesn't feel a whole lot like its predecessor anyway, maybe this isn't too surprising. It also costs a lot of money.

And while all this has been going on, we Brits may not have noticed that 'Pepsi' in the life of Wordstar has been gnawing at the foundations of Wordstar in the shape of NewStar Software Inc.'s NewWord.

Taking the NewWord Challenge

NewWord was developed by a group of former MicroPro employees headed up by the energetic and earnest Stan Reynolds. Stan Reynolds' philosophy being that if Wordstar had got stuck with the classic problem of being just too big a product to facelift significantly, then NewStar would provide the much needed missing features and give his erstwhile employers a run for their money.

Us cynical folk might suspect that if the original core of the software team that wrote and maintained the original product had moved out, then MicroPro would have had some problems re-working the cryptic source code for a major feature revision anyway. Hence the all-new completely re-written Wordstar 2000.

Well, Wordstar is an institution, and you just can't unseat an institution that easily, so New Star's early hopes for bashing Wordstar into a cocked hat by the simple expedient of providing more function for less money were not quite achieved. The product arrived to critical acclaim - but without the marketing clout, New Star never quite made the front page.

Which is a pity, because the product is as good a CPM wordprocessor as money can buy, and virtually totally WordStar compatible from command structures, through menu styles, to file compatibility. Plus all those neat extras that make the difference - or should do.

Many foreign distributors have spotted this gem twinkling in an American magazine, and rushed forward with missionary zeal to lighten the darkness of the WordStar world, only to be beaten into submission by the reality that if dealers can sell Wordstar for £400 odd, then why should they cut their own throats and put out NewWord for half or less? Good question.

Well, then along came Amstrad and the rules got changed. Pocket Wordstar appeared with 'most of the functionality of the real thing' - a polite way of providing MicroPro with an excuse to their existing dealers for shipping the product at a third of the standard cost.

Meanwhile, Stan Reynolds of Newstar had been reviewing the situation as an opportunity to step into what was obviously the new ball game with a rather more

adventurous approach. After all, with no dealers outside the US to pacify, he was in an ideal position to toss a full spec product into the pot at a price to make Wordstar dealers wince.

So here we are, the complete unexpurgated NewWord at £69.95 - including the incredible Spell Plus spell checker. Only for Amstrad owners (the product is fixed to avoid transportability to other CPM systems).

So what's in a name?

NewWord offers over 90% total compatibility with WordStar. The casual user would never know the difference, but the hardened user will delight in the extras -such as the un-erase feature (**[CTRL]U**) which gets you out of those awkward **[CTRL]Y** situations.

There's the built-in mail merge feature with conditional functions that add welcome and much needed intelligence to the process, and the ability to print at around 200-300 characters per second with the choice of printer being available at a menu supplied at print time, as well as during the initial set up installation.

Enough of the esoterica for the cognescenti, what does it do? NewWord is, first and foremost, a powerful word processing program. It is capable of doing just about everything you could want from such a program. In fact, it does a lot of things that few of us will ever try, and it seems safe to say that most users will take advantage of only a handful of its many features.

Of course, whenever there are numerous capabilities in a program, there are numerous things to learn in order to use it efficiently. There are dozens and dozens of commands that must be learned to take full advantage of the program, most of which involve striking three keys. However, if you're one of the many people who have already learned WordStar commands, you're in luck. With very few exceptions, NewWord used the very same commands to accomplish its tasks.

Learning all of these commands is not necessary, but key ones will have to be learned if the user doesn't want to spend valuable word processing minutes looking up menus or reading the reference card. In actuality, most users of NewWord will end up using only a dozen or so of the most common commands, and these will be committed to memory by rote, if nothing else.

Newword Check List

Editing and Layout

	LocoScript	WordStar CPM80	NewWord CPM80
What you see is what you get			
Justified text	●	●	●
Full proportional spacing option	●	○	†
Centre text	●	●	●
International/ASCII characters	●	○	○
Multiple type styles with full printer support and plain language selection menus	●	limited	†
Undelete	○	○	●
Column block move	○	●	●
Multiline headers and footers	●	○	●
Auto layout changes	●	○	●
Auto layout reform after changes	●	○	○
Standard template groups	●	●	●
Cut and paste	●	●	●
Bold	●	○	●
Underline	●	●	●
Multiple phrase memories	●	○	○
Hard/soft space/hyphen definition	●	●	●
Widow/orphan handling	●	○	○
Footnotes	○	*	*
Spellcheck add-ons	○	*	*

*(using add-on programs)

†additional dot command support

In the Amstrad environment, the SETKEYS utility allows the use to set up the function keys to emulate much of the 8256 keytop legending, as well as simply use the cursor keys.

Personally, I'm against customising function keys, since if you learn the basic **[CTRL]** sequences (which builds character and stiffens the spine anyway...) these will be fully transportable between different machines. And since NewWord runs on CPM80, CPM86, MSDOS and PCDOS, there's a good chance that you will encounter the product in a different environment where the function keys are meaningless, but the control sequences are identical.

Manual

The NewWord manual is an example of a labour of love. It is written with genuine feeling. One gets the impression that the author served time on the MicroPro help-line service and was determined that the NewStar phone would sit there quietly, minding it's own business while they got on with writing the code.

It's a somewhat telling point that the manual being shipped is supplemented by a fat 'addendum' - not covering bugs, but covering extra features that have been included since the original release. As Amstrad people know very well, the essence of making money in computing is knowing when to draw the line and sell. The perfectionists at NewStar show a classic but touching desire to keep polishing their product until it sparkles like a diamond.

The manual itself is a treat. Since it is essentially a rewrite of another 'long standing publication', the author could spend his time getting the presentation honed, and not worrying too much about the contents list. Even WordStar owners would benefit from a copy of the NewWord manual - but it isn't being supplied without the product for obvious reasons!

Printing is easy, and there are a number of special printing commands that allow you further design the look of a page or document. It is even relatively easy to merge different files while printing. By creating a data file with names and addresses, NewWord can give those of you in the form-letter business a quick and effective way to mail personalized letters to all your clients or potential contributors.

NewWord versus LocoScript

For a freeby, LocoScript takes some beating. In its role of typewriter replacement, it has no peer, although the omission of mailmerge and ASCII target files is a positive bloody nuisance.

This means that LocoScript cannot be used as a full screen program editor for Mallard BASIC programs - or any other programs for that matter. It also menas that LocoScript will not address an external printer (who want's to? you may well ask) since the external printer will be waiting for ASCII without the LocoScript token commands that tell the printer to perform its many party tricks.

On the CPC6128, NewWord is peerless at the price. This is a shame for software houses like Tasman who have built a reputation on honest quality software, since whilst they are trying to build up Tasword, in swoops one of the big league with all the macho stuff like document buffering to disc length (up to 360k files on the PCW8256 with second disc fitted), column block move, in-line format changes, print time selection of printer format, boilerplate, user number sub-directory management, very fast screen and document handling.

Beware: NewWord requires a second disc on the CPC6128 to really hum. It is quite possible to use it with a single drive configuration, but you will get fed up with swapping round the disc before long. Basically, you need to load the program using the submit file provided with the keyboard definer, and then with the program running on drive A:, create the document on the logical drive B:. Then swap the discs as required - thanks to NewWord's more restiricted use of overlays (when compared to Wordstar) users who can forgo the on-screen crib sheets of prompts (at help level 0) will generally be able to sail through an entire document only changing the disc at the end of the session.

However, any process requiring discs to be swapped in mid-session is liable to lose the lot sooner or later, so you've been warned.

PCW8256: Passion Waggon?

On the 8256, the RAM disc makes the operation of the occasional overlay virtually instantaneous, and the big screen installation (32x90) is enough to sell the whole system to dyed-in-the-wool Wordstar fanatics seeking the ultimate 'vehicle' for their passion. Copying the program files and overlays onto drive M: is achieved simply using pip, or creating a SUBMIT file (using NewWord in the non-document mode).

There are several areas where LocoScript scores: ease of use with the pull down menus, simple printer function control and in those areas where the basic LocoScript aim of providing a foolproof typewriter replacement trade off ease of use for some of the more daring and advanced WP functions.

It's horses for courses, and if you want to produce clean ASCII for external printers or program editing, then there is no facility within LS. In fact, simply to create SUBMIT files or to take advantage of the assemblers supplied with CPM plus, the absence of a friendly ASCII text handler may drive you into the jaws of the gruesome ED utility.

The faster screen of the PCW8256 helps a lot, and NewWord holds enough of the document in RAM to avoid disc buffering until you get above about 10 pages.

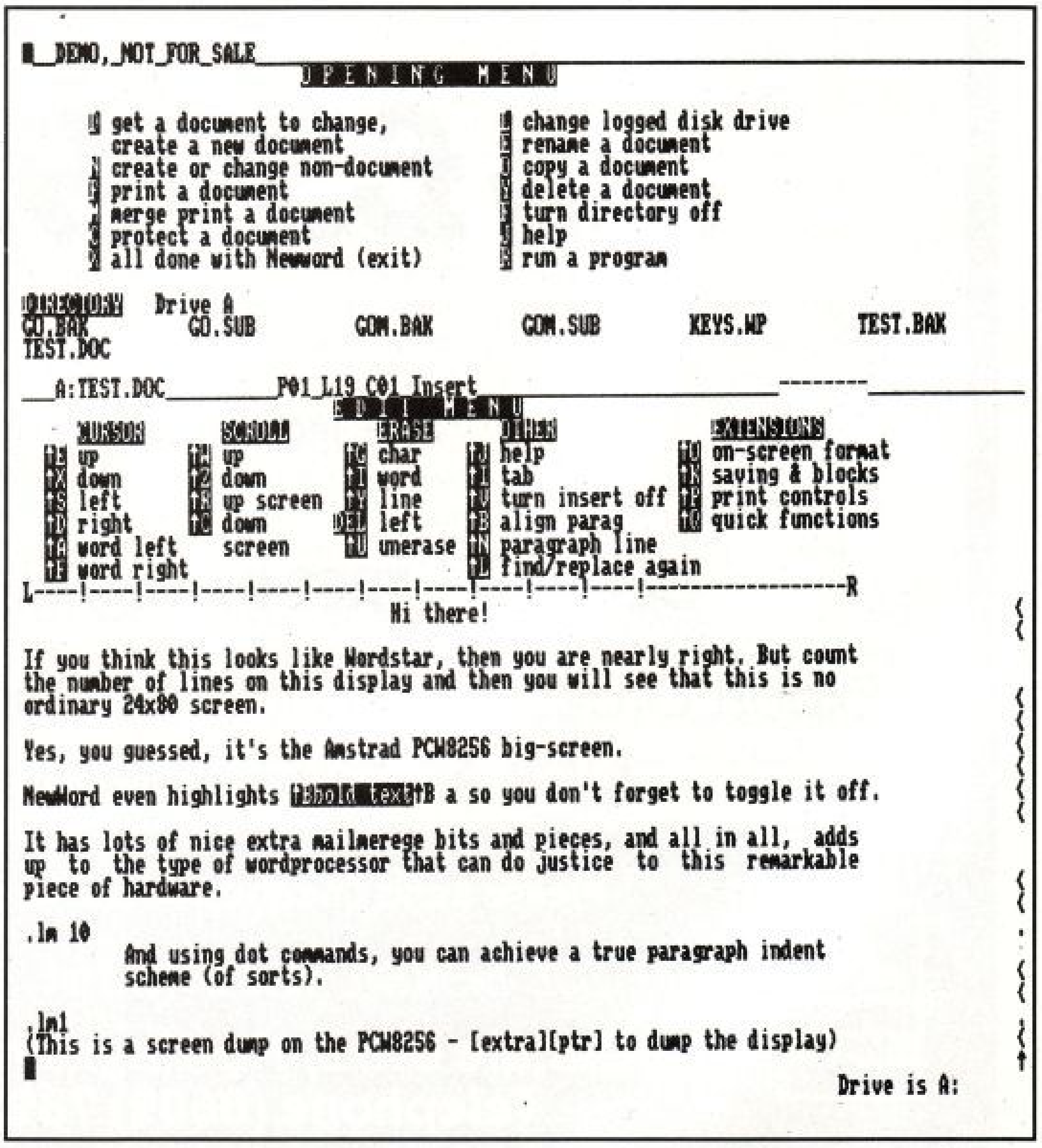
Conclusions

NewWord contains a full series of boilerplate and block functions, and as such has rather deeper pockets than the cut-price, cut-down Wordstar offered under the curious title of Pocket Wordstar.

Mailmergers will have a field day, and anyone who uses more than one printer will be delighted to find that the choice of all the standard protocols is available at print time.

And remember, if you create a document on NewWord, it can be read by Wordstar (and vice versa) although Wordstar will ignore the additional dot commands that are particular to NewWord.

The UK distributors of this product, New Star Software Limited, could easily prise the market away from WordStar, since at the Amstrad end of the business, the mystique of the name is much more likely to be a secondary consideration where value for money is concerned.



A case of *Déja Vu* for Wordstar freaks?

ABC

Convert your Amstrad 464 into an Amstrad 6128*

64K and 256K Memory Expansions for the CPC 464 Computer.

* **Total of 128K or 320K RAM available to user.**
* **Supplied with bank switching RSX software.**
* **Compatible with DKtronics 256K Silicon Disc.**
* **Requires no extra power supply.**
* **PRICE only £49.95 for 64K including VAT. and £99.95 for 256K including VAT.**

The 64K memory will give you the same amount and configuration of RAM as the CPC 6128, the 256K gives an extra 192K on top of this! The expansion will allow the use of CP/M+® opening up an even larger software base for Amstrad users.

The RAM can be accessed by means of bank switching using a single I/O port. Memory is actually switched in and out of the 64KZ80 address space in 16K sub-blocks (as are the ROMs). The port determines which particular combination of the original four 16K sub-blocks and any new sub-blocks from the expansion RAM will occupy the 64K address space at any time. The I/O port can be used from both BASIC and machine code. To use the additional 64K/256K, the expansion is supplied with bank switching software (although it can be switched without this software). The program adds some extra BASIC commands which make it possible to use the second 64K (or 3rd, 4th and 5th in the case of the 256K expansion) for storage for screens, windows, graphics and BASIC arrays. This ability means that you can write much larger BASIC programs, as most of the memory on the unexpanded CPC 464 is normally used for arrays, variables and graphics.

The additional BASIC commands are:

I BANK,n	Map a bank of 16K directly into memory space.
I SWAP	Alternate between the low and high screens.
I LOW	Change to the low screen.
I HIGH	Change to the high screen. (Default screen).
I SAVES,n	Store a screen to 16K bank
I LOADS,n	Retrieve a screen from a 16K bank
I SAVEW,w,n	Store a window's contents into expansion RAM.
I LOADW,w,n	Load a window with data from expansion RAM.
I SAVED,n,s,1	Transfer original RAM to expansion RAM.
I LOADD,n,s,1	Load original RAM from expansion RAM.
I PEEK,n,s,v	Read the value of a byte in expansion RAM.
I POKE,n,s,v	Change a byte in the expansion RAM.

These commands make such features as pull down menus, full screen animation, and large spread-sheet type programs or Data-Bases very easily programmed from BASIC as never before possible on the unexpanded CPC 464.

NOTE: The contents of the expansion RAM are retained if the computer is reset. The consequence of this is that if the RAM is used for machine code, the contents will remain even if the computer crashes!

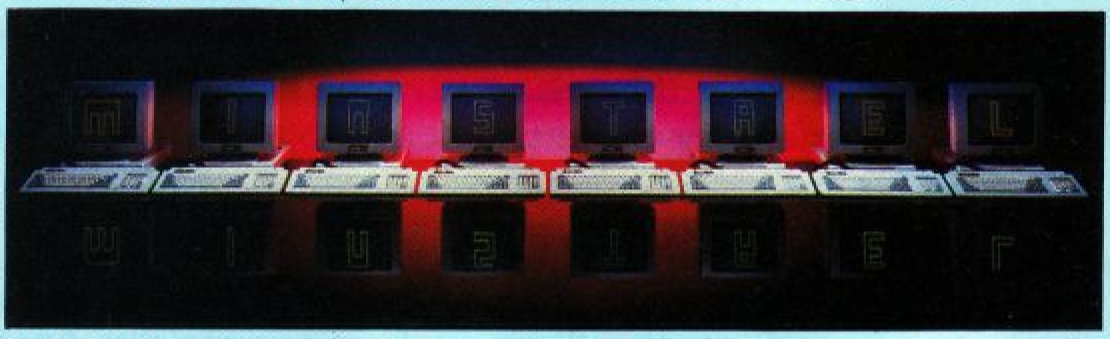
Available for 664 and 6128 1st November 1985.
*Except for differences in the firmware and BASIC ROMS.

dktronics

THE POWER BEHIND YOUR AMSTRAD

ABC UP GRADE

Life after the 8256?



I'm about to give you lot some advice that won't be too popular in some quarters.

David Ward opens up a series on the logical and progressive path for business users taking their first tentative steps with Amstrad computers. It's never too early to plan your next move in this business....

The advice is simple and succinct: single user micro systems are a sham for running a serious business. Great for wordprocessing in the rolè of the PCW8256 - but only suitable as a training ground for proper accounting and stock management functions.

This won't come as too much of a shock to those of you who have paid the meagre sum asked by Amstrad (I'll show why in a moment) but if you are one of the million or so who has caughed up well over ·2000 for a PC/clone or similar, then I'm terribly sorry, but I think you've wasted your money in a rather big way.

The sight of an office filled with IBM PCs may bring a lump to throat of many a computer dealer lucky enough to be riding the crest of the wave being perpetuated by the majority of the micro press - but it really is a waste of time and effort, unless you are into executive toys and status symbols.

The trouble seems to be that most journalists have little conception of the needs of a living business, and thus seek ever more feverishly to get onto the next thrilling development that's going to attract a readership which is still predominantly technology led.

The Whys

The reasons are simple enough for anyone to grasp. A business relies on working with common data: be it stock, accounts, customer records or whatever. Unless you are always determined to be a one-person operation, then a single user micro is an impossible bottleneck. Only one person can 'do the accounts' at one time. Only one person can send mailings at a time - and so on.

With a multiuser system, one person can be entering invoice data, while another produces statements, while another produces the accompanying mail shot letters. All from common data, and all on a single hard disc drive that makes managing the usual alternative a box of floppies seem as pointless as trying to work with cassettes.

At the hardware level, the reasons are just as obvious: one fancy printer can be shared between all the users without switches, plugging cables in and out or other practices destined to wreak havoc in any system. After all, plugs and cables are probably the most vunerable element of most installations.

And the other draft printer can similarly be shared by users simply using software re-direction.

In order to get any real commercial benefit from the features of colour screen graphics displays, the operator will have to be well above average intelligence and computer literacy. The average packhorse of business administration is a VDU operator, not a mouse manipulating, icon crazed technicolour technofreak.

Hardware that does much more than accept and display data in a few simple formats is largely wasted.

The Wherefores

I mentioned that Amstrad owners need not despair - the reason is simple: Astrad systems are all available with the necessary

hardware and software to configure themselves as terminals on a multiuser network for rather less than the cost of a standard 'unintelligent' terminal used on such networks.

Aha - the 16 bit micro promoters say - but you can also network your 16 bitters so that they all talk to each other and exchange data. Phooey.

The reliable low cost PC network has yet to be devised and implemented, since such schemes tend to suffer from one rather inescapable drawback: if Fred decides to get awkward and switches off his PC, then the network has lost the benefit of Fred's disk/printer or whatever else it was Fred was contributing to the Greater Good. And heaven knows what might been going on at the time Fred pulled the plug.

Most such networks bear the hallmarks of retrofit compromises that are simply devised to try and keep hold of the customers as their needs become more sophisticated and diverse than the standard single user concept can manage.

The Solutions

There is only one way to operate a multiuser micro system, and that is with a central file server and print spooling facility that is independent of the whims of individual users on the network. But beware the term 'file server', for there are several suggested schemes in file serving, but the only one worthy of closer examination is one where full record locking applies. In other words, one user cannot update a file that in use by another - the alternative is pure chaos.

Northern Computers are to be congratulated on having shown the initiative to undertake a very major project for Amstrad computer systems. Their low cost network works at high speeds and shows enormous promise for the educational environment. For the commercial environment, the operating system software is not quite foolproof enough to be entrusted with delicate transaction processes, nor is it yet clear how very large datafiles can be managed under multiuser applications.

Programs are not run from the network controller, but downloaded into the individual local user stations. Compared to anything else in the educational scene, the Northen network stands out like a beacon of good sense, and so continues in the fine tradition of Amstrad by offering a workmanlike solution at a fraction of the cost of other lesser approaches.

The Business Solution

For the small business, the offers of a mutli-user solution are rather more prolific, but there is still only one micro network with true worldwide installed experience, and all the features considered essential in managing the system with full security and data locking. Paradoxically, and much against the popular wisdom, it's not anything particularly to do with hardware, but it's really all down to some brilliant software from a most unlikely Californian operation called Software 2000.

TurboDos is written and maintained (so legend has it) by one man whose brainchild it has been from day one. As a result, it is probably the most superbly elegant, clear and modular scheme in the marketplace and is endowed with quite superb transportability in terms of harware.

Never heard of it, eh? Well, Software 2000 won't be too desparately unhappy, since envious estimates of their business reckon that the turnover per head of this small company approaches $10m with a goodly proportion of that being net income. Just enough to keep the wolf from the door.

The key to the versatility of TurboDos is the way in which it manages to emulate CPM80 - and on the same network, intermingle CPM86 and PCDOS. TurboDos' CPM persona is rather faster than the real thing, with disc efficiency greatly improved. The day TurboDos went on the market, there was already a vast wealth of low cost software waiting to jump aboard. Try telling that to the UNIX user.

In brief, TurboDos turns micros into mainframes like nothing else around at the moment. And it's been doing it for the past 5 years. Devotees tend to promote it with missionary zeal.

TurboDos and Amstrad?

The leading UK manufacturer using TurboDos is HM Systems Ltd., whose 'Minstrel' systems have formed the core of the Amstrad software development effort, as well as providing the editorial and manual generation wordprocesing facilities on line to our in-house typesetting facility. Ever since Amstrad has started to threaten to join in the business marketplace, HM have been waiting for the opportunity to use Amstrad computers as terminals on their networks.

The essence of the HM scheme is a central controller box with a backplane based on the venerable but widely used and understood S100 system. This is a 100 way bus orginally devised for 8080/Z80, but brought into the 80's with everything from 68000 to 286 processor cards and peripherals.

The S100 bus was once scathingly referred to as the 'hobbyist' bus by manufacturers trying to justify their painfully more costly non-standard alternatives. In this business, the market abhors a standard if it can be avoided, since the result is that most feared enemy of technological innovation: commercial competition!



The unprepossessing appearance of the Minstrel 2 system

The configuration

The Minstrel unit houses a variety of discs (floppy and hard), the disc controller card, a master card and a number of slave processors. Connection is via RS232 to local dumb terminals, or via ARCNET to any number of other network systems - or any of the many PC schemes that incorporate the Arcnet option.

In one quantum leap, the user who has outgrown his 8256 (or 664/6128) plugs into his RS232 interface and the Minstrel provides high speed central processing with total compatibility with existing CP/M datafiles and programs.

In order to manage record locking properly, correctly configured software will be required, but even without this, the system is completely viable as a multiuser environment.

HM produce one version of the Minstrel known as the Amstrel, which features a 3 inch disc alongside the 5.25 inch disc to provide a very fast and convenient way of developing and transferring data and software.

The Amsoft system recently acquired its first 80186 master controller, and is now quite happily running fast 16 bit software on 16 bit slaves - using Amstrad computers as terminals, of course!

Premature

Since this feature may be regarded as somewhat premature in view of the fact that the Amstrad CP/M Plus systems are only barely on the market, we'll stop at this point, with the promise of building up the picture over subsequent issues. However, there are likely to be some Amstrad owners whose choice of an Amstrad home computer may now be prompting them sooner they imagined to re-examine their exploitation of this approach at work.

Similarly, there are a number of software developers whose task would be made several times more efficient by developing with this approach. HM Systems will be delighted to supply more details.

Meanwhile, all you lot with your shiney new machines can follow our progress in this series, and thanks to the improved efficiency brought about by your new Amstrad computers, you should be just about ready to take the next logical step by the time we conclude.

Remember, the single user PC is an island -and all most networks provide is an occasional ferry boat service. Don't upgrade to a bigger island when the logical development for the business user is the scheme that provides complete road, rail and telecoms links: TurboDos!

And now for the damage.....

And the cost? Less than you would imagine, less than £7000 for a basic four user system that uses the PCW8256 as its terminals. Complete with a 20MByte hard disc system, and the option to expand to around 12 users (before Arcnetting to another master system) at around £600 per additonal user.

Compared to the same capability using properly networked IBM PCs, the cost works out at around half.

TurboDOS™

ABC

CPM SOFTWHERE?

IT'S THE REAL THING ......Plus!



Yes, thanks to Amstrad's new CPM Plus systems with a whopping great big 61k of TPA, all those lovely CPM classics will now run without compromise. In fact, you'll find the classics have more space for data, since most CPM80 programs only expect to find around 55k of TPA. Sorcim's SuperCalc2 becomes SupremeCalc2, MicroPro's WordStar becomes WordGalaxy and dBase II thrives.

Less well known but functionally superior products also sparkle on Amstrad CPM Plus. The ultimate 8bit (Wordstar compatible plus) wordprocessor with built-in mailmerge, NewWord complements the ultimate 8bit spell checker: Oasis Systems Word Plus in an unbeatable £69 package.

You don't need a calculator to work out that Software Technology's Cracker Plus spreadsheet and mathematical modeller at £49 is an absolute bargain for Amstrad CPM Plus users.

Aha, but where can you get them on a 3 inch disc?

Simple, call New Star Software Ltd., specialists in Amstrad CPM Plus installations. We will supply your program custom installed for your Amstrad 3 inch system, state the model when ordering.

There's also a number of classics available for Amstrad CPM2.2: Caxton's Cardbox, Touch 'n Go and and Brainstorm for example.

Our catalogue (which is also being shipped on the issue 12 UserSoft listings Disc as an ASCII textfile) indicates availability.

NewStar Software has been specifically set up in conjunction with the UK's leading trade software source to provide a retail mail order service to Amstrad CP/M users. Details of customer support services and on-line assistance are supplied with our catalogue.

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The Accountants choice . . . simple as ABC

A is for AMSTRAD PCW8256

B is for BOOK-KEEPING

C is for COMPACT

Award* winning Compact Software, recommended by leading British accountants, have now extended their range to include software for the new AMSTRAD PCW8256 which will easily relieve the small businessman of his book-keeping headaches, particularly with V.A.T.

Compact Daybook has been developed to provide an entry level system for the first time computer user, wishing to computerise a manual book-keeping system. The software has been designed to imitate manually kept books that would normally be maintained in a small business - i.e. Sales Daybook, Purchase Daybook, Cash Book, and a book-keeper or businessman familiar with these procedures would establish an immediate rapport with the software.

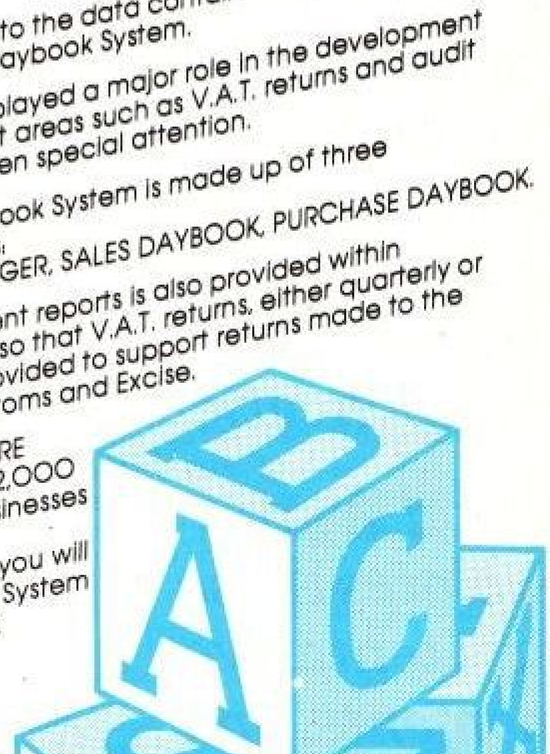
Although Daybook is designed as an entry level system, the software is compatible with the more sophisticated accounting packages available within the Compact range. If further applications such as invoicing or Sales Ledger accounting are required at a later date, there are no changes necessary to the data contained within the files built up under the Daybook System.

Accountants have played a major role in the development of the system so that areas such as V.A.T. returns and audit trails have been given special attention.

The Compact Daybook System is made up of three interlinking modules:
NOMINAL LEDGER, SALES DAYBOOK, PURCHASE DAYBOOK.

A set of management reports is also provided within Compact Daybook so that V.A.T. returns, either quarterly or monthly, can be provided to support returns made to the Department of Customs and Excise.

COMPACT SOFTWARE currently has over 12,000 users from small businesses to multi-nationals. Whichever you are you will find the 'DAYBOOK' System as easy as . . . A B C.



* In 1984 COMPACT SOFTWARE won the 'RITA' award which is to the information technology world what the 'Oscar' is to the film industry.

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ABC

Choosing software

What do you want?

At last the message is getting home to potential computer buyers: never mind the technology, feel the application.

David Ward explores those first tentative moments, and starts what could be the agony column of the decade......

For as long as I can remember, computer pundits have been divided between the 'gee-whizzers' whose sole aim in life is to seek out and inject their next fix of technology: and the more wizened critics who recognise that the *application* is actually the more important consideration.

Gee-whizzing is great for hobbyists and 'techies', but for anyone not enthralled with the technology of computing for its own sake, it can be a remarkably irrelevant diversion. Not surprisingly, Amstrad personifies the latter outlook, with Alan Sugar making no bones about the fact that he is in business for the money, and will only continue in that vein as long as his firm delivers what the mass market wants.

This outlook may irritate those chanting the current round of 68000 incantations, but at least both new Amstrad offerings have the benefit of all the CPM80 programs, coupled with a price that marks a substantial breakthrough for serious computing.

CP/M Plus machines are ideal for small business computing. There's a wealth of software already available, and most of it is bug-free and a good deal cheaper than some of the newer offerings.

The one-eyed monarchs

Feature writers in the national press have persisted in the myth that all you need for small business computing is a Spectrum with Masterfile and Tasword. And whilst these two pieces of software are outstanding software for home computers, who but a lunatic would trust their commercial welfare to a cassette based system with a reliability factor that is only equalled by a British Rail timetable. I wonder if these journalists have actually ever trusted their livelihoods to such set-ups?

So, the first piece of advice I have to offer is to ignore advice and make your own mind up. Not only is this the only way to achieve that sense of independence that is vital for the self propelled computer user, it will also come as a great relief to all your friends and relations who are tagged with the unfortunate label of 'knowing about computers' and thus forever blighted with requests for impossible free advice that may well haunt them for the rest of eternity. (And I should know.)

The second piece of advice is a direct consequence of the first. You must understand what it is you want to achieve with your computer, and the only way to do this is to sit down and write it all down on a piece of paper. If you have access to the brilliant Brainstorm program then you can use this a means of developing your ideas, since it allows to organise a jumble of ideas into something approaching a coherent plan. Failing that, I offer the following questionnaire that will allow someone whose job it is to know about these things to choose the solution to your particular problem.

Certainly many of the questions are loaded: part of the process of any honest and objective questionnaire should be to get the subject to think a little more deeply about the topics involved. The last thing anyone ought to want to do is sell you an inappropriate solution to a readily definable problem.

In the following, we are going to assume that you will need a wordprocessing, spreadsheet and database package for the fundamentals such as letter writing, planning/budgeting and keeping client lists. Even if you don't think so, nanny knows best, so you'll just have to put up with it.

Apart from the utility, the familiarity it will give you with the hardware will stand you all in good stead for the rigours that lie further along the way: the thorniest and potentially the most rewarding aspect of computerisation - a coherent and thoroughly integrated overall approach to accounts and administration. Don't expect this to come with your first set of hardware, but do expect to lay the foundations for an upwardly compatible approach as needs and budgets expand.

I'll select some of the more interesting cases to explain my suggestions in more detail. Maybe the respondents will play along and we can trace case histories. It could be fun.

Don't forget to include a stamped self-addressed envelope if you want a reply.

Section (i): preconceptions

1. Do you really want to computerise your business - or is your prime concern to find out more about computers and computing?
a) Computerise .... ☐
b) Learn .... ☐

2. How much
a) do you want spend? .... ☐
b) have you budgeted to spend? .... ☐
c) do you think you ought to spend? .... ☐

3. Put a rating (0-9) against each of the following popular facets of business computing to indicate your anticipated use for the computer:
a) Wordprocessing .... ☐
b) Spreadsheet .... ☐
c) Database .... ☐
d) Accounts .... ☐
e) Scheduling .... ☐
f) Communications .... ☐

4. Why do you want to computerise?
a) Improve efficiency .... ☐
b) Save money .... ☐
c) Cut back staffing .... ☐
d) Expand without taking on extra staff .. ☐
e) Don't know, but everyone else is .... ☐

Section (ii): your background

5. How big is your business
a) One person band .... ☐
b) 1-5 .... ☐
c) 6-15 .... ☐
d) 16-30 .... ☐
e) 30+ .... ☐

6. Have you or any of the other staff any previous experience of computing in a commercial context?
a) Yes .... ☐
b) No .... ☐
c) If yes, please give brief details (less than 50 words)

....

....

....

....

....

7. Have you or any of the other staff any previous experience of computing in a home or educational context?
a) Yes .... ☐
b) No .... ☐
c) If yes, please give brief details (less than 50 words)

....

....

....

....

....

8. Which is likely to be the most costly element of computerising your business?
a) the hardware .... ☐
b) the software .... ☐
c) your time in getting to grips with computerisation .... ☐

9. Assuming you master the first phase, what do you see as the next logical step to take?
a) More of the same .... ☐
b) Networking .... ☐
c) Multiuser systems .... ☐
d) More bits and more memory .... ☐
e) A further assessment of your needs when the time arrives .... ☐

10. Is your knowledge of accountancy practice:
a) Nil .... ☐
b) Rudimentary .... ☐
c) Passable .... ☐
d) Good .... ☐
e) Red hot .... ☐

Section (iii): the shape of the business. You should answer this honestly - once for your position today, and then go back and assume that your hopes are fulfilled, and how you might answer these questions in a year's time. This second aspect is probably the most crucial and underestimated consideration in any small firm computerisation project.

11. Is your business:
a) Manufacturing .... ☐
b) Wholesale .... ☐
c) Retail .... ☐
d) Service .... ☐
e) Other .... ☐

12. Please outline the main products and services being offered in under 100 words:

....

....

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....

....

13. Please indicate the scope of your business (tick all appropriate items)
a) Sell on credit .... ☐
b) Buy on credit .... ☐
c) Sell for cash .... ☐
d) Buy for cash .... ☐
e) Sell using credit card schemes .... ☐
f) Import using foreign currency .... ☐
g) Sell accepting foreign currency .... ☐

14. Stock: do you
a) Keep meticulous stock records .... ☐
b) Count up once a year .... ☐

15. Stock: would it help you to know you spot stock position:
a) A lot .... ☐
b) A little .... ☐
c) Not at all .... ☐

16. Do you issue credit notes or cash refunds
a) Credit notes .... ☐
b) Cash refunds .... ☐

17. Have you been told by a specialist what hardware would suit you best:
a) Yes - please state in less than 50 words a summary of the advice and reasoning (if any):

....

....

....

....

....

....

b) No .... ☐

18. What was your view of this advice?
a) Good .... ☐
b) Bad .... ☐
c) Don't know .... ☐

18. Have you been told by a specialist what software would suit you best:
a) Yes - please state in less than 50 words a summary of the advice and reasoning (if any):

....

....

....

....

b) No .... ☐

19. What was your view of this advice?
a) Good .... ☐
b) Bad .... ☐
c) Don't know .... ☐

That little lot may seem rather obvious - in which case you are going to be good candidates for organising and computerising your system. The first essential is a workable manual system, and a clear idea of your objectives in computerisation.

Be philosophical if the budget runs out before the results roll in - but also remember that some of the most unlikely users find they have a penchant for the computer that they never dreamed possible.

ABC

TurboDOS power for multi-user networking



It's not easy to build an effective multi-user system.

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This means 16 bit computing power at 8 bit prices for you.

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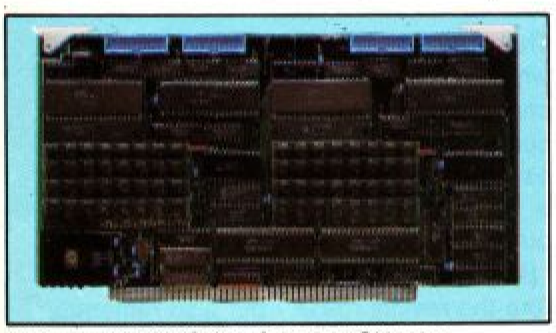
TurboDOS reads programs written for CP/M II,† CP/M 86, MP/M II, MP/M 86, has PC DOS emulation, and allows IBM PCs or lookalikes to share the resources of a Minstrel 2 system.

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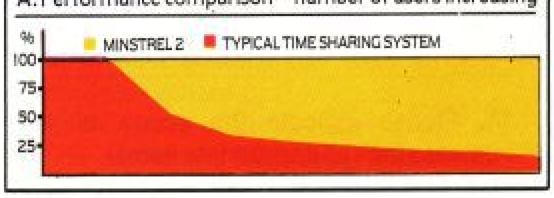
Entry cost for a two-user system with 20Mb hard disk capacity is £6250.00. Additional workstations cost £1110.00 inclusive.

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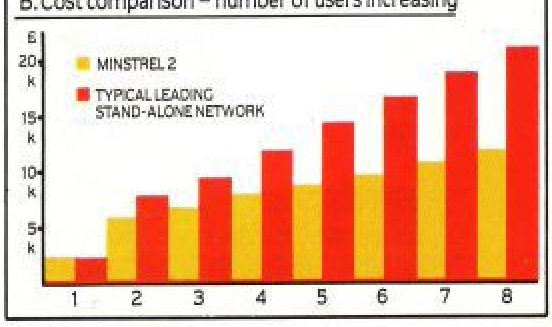
HM Systems HTS 86. 16 bit performance at 8 bit prices.

A. Performance comparison – number of users increasing



Costs rise and performance suffers when a number of terminals share a common processor. Graph B shows a network of leading stand-alone computers when compared with Minstrel 2. Graph A shows the effect on performance of timesharing compared with Minstrel 2.

B. Cost comparison – number of users increasing



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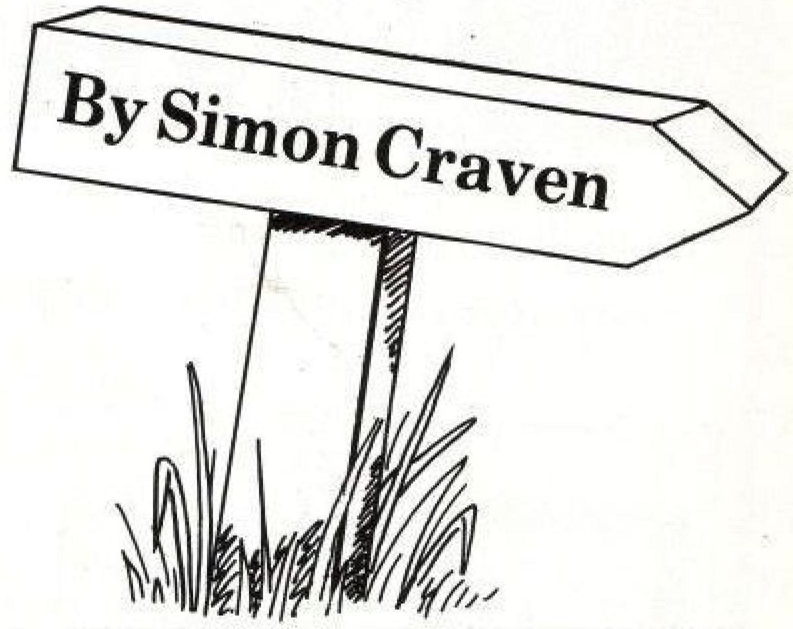
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Life in the Fast Lane



The price/performance ratio of personal computers has fallen dramatically in recent years; the £300 that used to buy you a bare-bones CPU with a miserable amount of memory now purchases a 128K CP/M system with a disc drive and a high-resolution monochrome monitor. The other essential part of a complete computer system is a printer, but apart from a gradual downwards drift in price, these have changed very little during the last few years. Progress is by gradual development rather than revolutionary change.

The latest refinement to become popular among dot matrix printers is the ability to produce fully-formed characters at a reduced printing speed. The buzzword is NLQ, for Near Letter Quality, and the end results approach the print quality offered by daisywheel printers, while still retaining the versatility of a dot-matrix unit. The hardware of dot-matrix print mechanisms has been able to do this for some time - any printer capable of pin-addressable graphics should be able to cope - but only recently has the controlling firmware caught up. Fancy fully-formed characters are just another kind of specialised graphics, but if they are to be drawn efficiently, in the shortest time possible, the printer's ROM must be efficiently programmed.

Another necessity if a reasonable NLQ printing speed is to be obtained is generally high speed in the draft mode. Speed costs money, and consequently the dot-matrix printers with the best NLQ speed and quality are rather expensive, usually costing in excess of £1000. This does seem like a lot to pay for a printer, especially if you bought your entire computer system for £300, but if you consider that one NLQ printer can effectively replace a draft printer like an Epson FX100 'and', a daisywheel printer such as a Juki 6300, beating both specialist printers in terms of speed, looks a lot more reasonable.

Two contrasting NLQ dot-matrix printers are the Epson LQ1500 and the Oki Microline 84XS. The Epson is an all-new design, which has taken Epson up-market from their familiar MX, RX and FX series. Epson printers are well known for their reliability and good service back-up, but the LQ1500 is the first Epson for some time to come near the top of its price class in print quality and speed.

The LQ1500 control codes maintain upward compatibility with the earlier Epson printers, which makes it suitable for use with a very wide number of software packages. Almost all applications programs which rely on printed output include Epson printer drivers.

In contrast to the all-new Epson, the Oki Microline 84XS is proof of the slow rate of evolution in the printer market. It is an updated version of the standard Microline 84 which has been in production for several years. The firmware is extensively revised in the XS version, enabling the unit to produce NLQ print quality in a number of typestyles, as well as doing everything that the basic Microline 84 achieves. However, the age of the basic design is evident in the bulk and weight of the printer. At a time when all components of personal computer systems are getting lighter and smaller, it comes as a real surprise to try and pick up either the Microline or the Epson and find that you can't. Both weigh in at 31lb, which is over 14kg, for the basic unit alone. Adding tractor units for continuous stationery or sheet feeders (available for both printers) will boost the weight and bulk considerably. Anyone who plans to use the 84XS or LQ1500 on a desktop had better make sure that it will fit, along with the rest of the computer. Bearing the weight in mind, a separate table would make more sense.

Ribbon loading is another area in which the Oki looks old. The vast majority of printers and electric typewriters have used easily-replaced cartridge ribbons for some years, but the Oki uses an old-fashioned two-spool ribbon which is awkward, messy and time-consuming to replace. The DIP switches are also hard to get at, which could cause problems for anyone who needs to change the settings. Naturally, Amstrad users are unlikely to fall into this category.

Ergonomically, the Epson is superior. It has a large cartridge ribbon which lasts a long time. Apart from ease of replacement, the cartridge ribbon has another advantage over the separate ribbon spools of the Oki when ribbon life nears its end. Multistrike cartridge ribbons do not run out suddenly; they just wear out gradually, getting fainter and fainter. If you are using a spool ribbon, it will have to be rewound or replaced when it reaches the end of the line. The one-pass carbon film ribbons used by many daisywheel printers are even worse; they just stop dead and cannot be resurrected at all. Inconvenient if the shops are shut and you have to finish printing an urgent report!

Both units are supplied with a Centronics-type parallel interface as standard, using the usual Amphenol connector. Serial interfaces are available at extra cost, but most

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Amstrad users will prefer to keep their add-on RS-232 ports free for more interesting uses than driving printers.

When it comes to print quality in NLQ mode, the Oki makes up some lost ground. If you look hard at output from either printer, you can see that the characters are made up from dots instead of being punched out solidly. The quality you get is not yet quite as good as the IBM Selectric look, but you get prettier characters than most manual typewriters, with cloth ribbons, could produce. NLQ characters from the Epson are more rounded, in imitation of letters from a typical electric typewriter, and ironically this makes the dot matrix effect more noticeable. The Oki's NLQ character sets are slightly squarer, making the dots harder to spot.

The other major element of printer performance is speed. Benchmarking printers is notoriously difficult, as the nature of the material being printed can have dramatic effects on the resulting number of characters per second. One thing is sure, however, the CPS figures printed in the advertisements are effectively no more than science fiction. Even as a means of determining relative performance, one machine against another, they are unreliable as it is impossible to deduce from the raw figures what sort of tests were run on each printer.

For the purposes of this review, three test chunks of text were printed on each machine. The first is a two-page repetition of the alphabet, margin to margin across eighty columns. The second is a single-page business letter, introducing such complications as addresses in the top left corner, incomplete lines, changing margins, varying line spacing etc. The third is a two-page print out of tabular data, such as many programmers and spreadsheet users produce. These were printed using simple Basic programs on a CPC6128.

The results for the default draft mode (high speed, low quality), and the default NLQ mode on each printer show that in draft mode, there is practically nothing in it. The timings for the wall-to-wall data and letters are the same for both printers, and the Oki is only four seconds behind on the tabular data.

In NLQ mode, the Oki's slightly superior print quality is more than offset by its lower speed. The Epson has a superiority of about 50% in the wall-to-wall text test, and gets closer to twice the speed of the Oki in the more realsitic tests.

The Epson is a little cheaper than the Oki at £1100 plus VAT against £1295 plus VAT. This price advantage helps confirm the LQ1500 as the better buy of this pair. Its speed advantage in NLQ mode can not be ignored, and its software compatibility with earlier Epsons should make life easy for users who work with CP/M software - most serious CP/M programs have Epson printer drivers included.

Epson LQ1500

Speed (secs)

	Draft	NLQ
Test 1	62	148
Test 2	15	28
Test3	44	112

Character matrix:

Draft	9 x 23
NLQ	15 x 23

Dimensions:

Height	130 mm
Width	604 mm
Depth	363 mm
Weight	14 kg

Price: £1100+VAT

Supplier: Epson UK Ltd. (01) 902 8892

Oki Microline 84XS

Speed (secs)

	Draft	NLQ
Test 1	62	200
Test 2	15	59
Test 3	48	194

Character matrix:

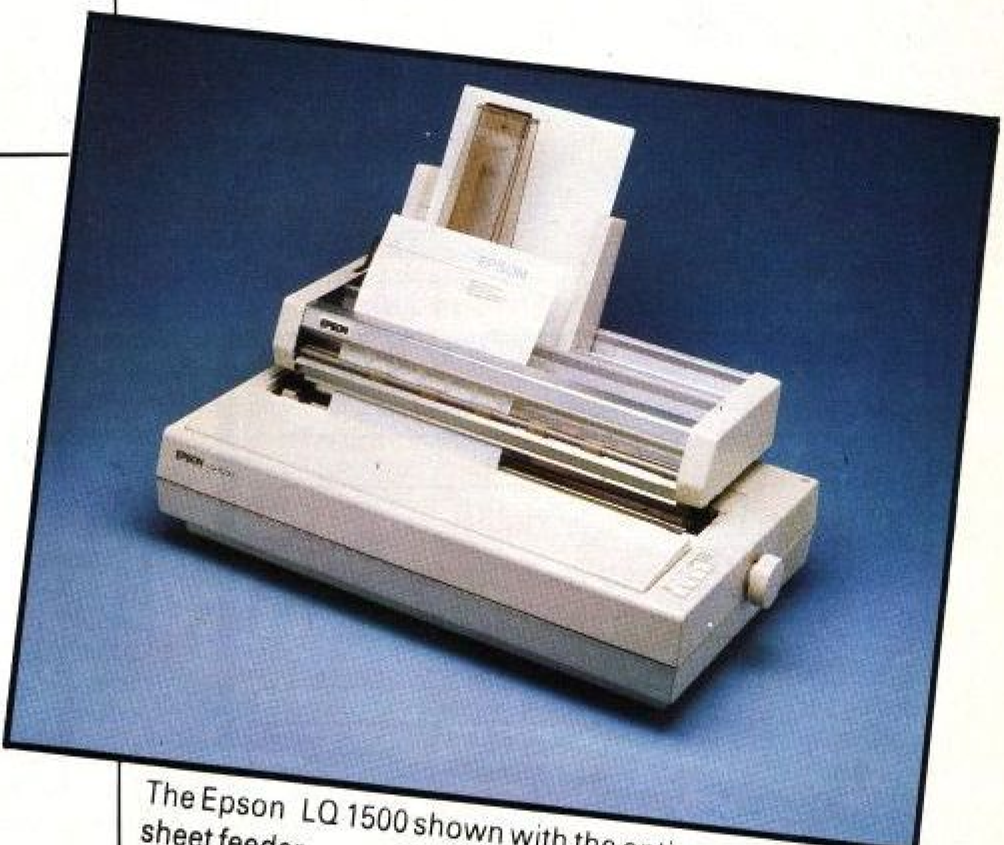
Draft	9 x 9
NLQ	18 x 18

Dimensions:

Height	132 mm
Width	510 mm
Depth	327 mm
Weight	14 kg

Price: £1295+VAT

Supplier: X-Data Ltd. (0753) 72331



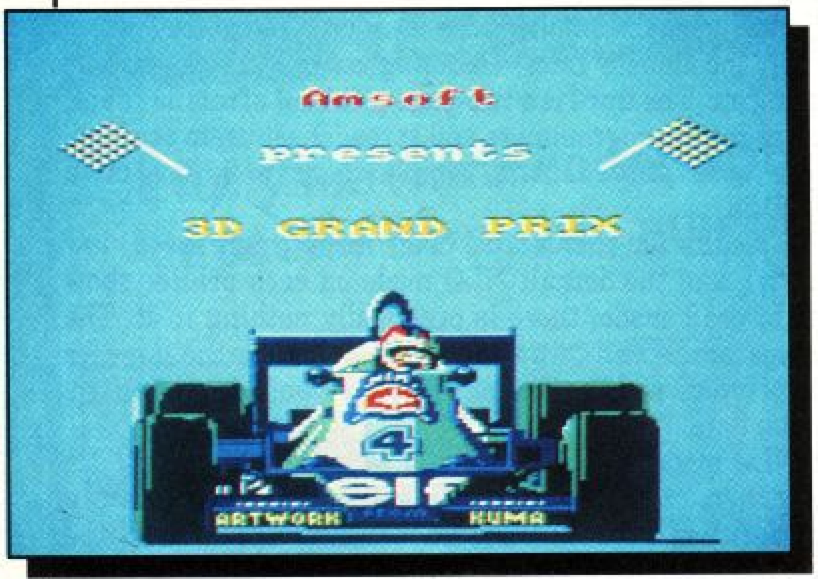
The Epson LQ 1500 shown with the optional sheet feeder

ACU

SOFTWARE REVIEWS

Game of the Month

3D GRAND PRIX





AUTHOR AMSOFT GOLD
PRICE £9.95 / £13.95 DISC

GRAPHICS	18	FIRST IMPRESSION	19
SOUND	15	LASTING IMPRESSION	19
POLISH	19	VALUE	19

COMMENT REAL ALAIN PROST STUFF!

All scores out of 20!

Car racing games are among the best established computer programs. Atari produced 'Night Driver' for the arcades many years ago, since then there has been a steady flow of car-based games in the arcades, the most spectacular being 'Pole Position'. Following the general trend of arcade games being adapted to home computer use, Amsoft have produced 3D Grand Prix.

All the features which made 'Pole Position' a hit are present in 3D Grand Prix, plus a few more. As with the real Formula 1 championship you have to race around tracks dotted throughout the world. There are eight circuits in all. You start at Zanduoot and then progress through Silverstone, Anderstorp, Jarama, Roeur, Brands Hatch, Kyahami and finally Mosport after which you revisit Zanduoot. All without going through Duty Free.

The program comes with a loose paper insert which shows all the circuits in enough detail for you to work out what to expect at the next bend. It is a shame that the start line is not included and the addition of the names of the bends would have helped add colour. The scenery scrolls past, showing a castle, bridges and adding a touch of realism. Unfortunately, the scenery is limited so you can't tell where you are on the track by just looking at your surroundings. As you get to know the tracks, the game gets easier to play. To progress from one track to another you need to finish in the first three at the end of a three lap race. If the authors had been sticklers for detail and gone for a full 65 lap, race 3D Grand Prix would have become tedious in the extreme.

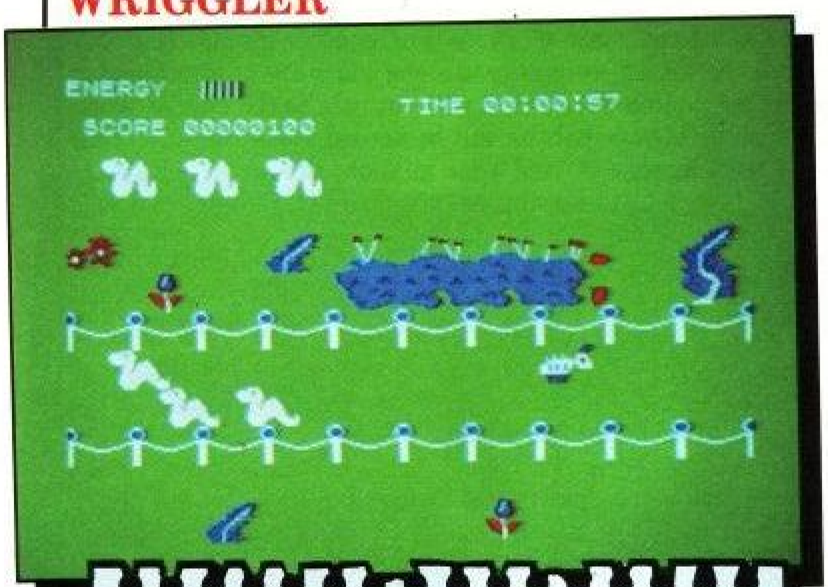
Circuits are not graded in levels of difficulty, in the early stages of development, Silverstone was going to be the first track and it is still the easiest. It was, however, decided that Zandouoort had much prettier weaving bends and so would make the game more addictive. The game gets progressively harder as you progress because the rival cars get faster and faster. All the cars are colour coded for speed, red, that's you, being the fastest.

Technically, 3D Grand Prix is a clever game. A lot of work is being done by the computer while you are playing. Having two rival cars and a double bend ahead of you displaying all this besides keeping the relative movements of the cars updated is no easy task. Amsoft have gone one better and added front wheels that move and rear view mirrors. The mirrors are very useful, they allow you to see when to overtake another car, instead of just being parallel, and they show you from which side the rival is going to try and overtake. There are few sights as satisfying as watching the car in the mirror getting smaller. After the lights go red you have five seconds before they turn green and you have to accelerate hard to stay in pole position.

As with a real racing car you have to use the rev counter to maximise acceleration and minimise wear on the engine. If you overdo the revs, a thermometer indicates the danger until the engine seizes. This is only temporary, you can restart once the car cools, with a big enough lead or close to the end of a race you can risk running the engine a bit hot. For the rest of the time it is easier to leave the car in fourth and slow right down for corners - the engine won't stall. If you drive too fast you risk a skid. An approaching skid is signalled by ear-piercing tyre squeal. It is possible to avoid the skid by changing down, to the detriment of the engine temperature. A much more effective way of slowing down is to drive over the grass. All the cars drive around the circuit following the best possible line, this entails taking the corners in an out-in-out fashion. Opposing cars pay no heed to your road position, they will carve you up and even run into you in an attempt to take the corner perfectly.

3D Grand Prix is one of the new Amsoft Gold titles and so costs £1 more but the tape qualifies for a better box than the standard Amsoft products. Amsoft did have a reputation for producing very ordinary software at high prices, more games like this will provide them with the ammunition to rebuff the critics. This game is deservedly destined for the number 1 slot in the Gallup chart.

WRIGGLER



AUTHOR Romantic Robot
PRICE £7.95
GRAPHICS 12 | FIRST IMPRESSION 7
SOUND 8 | LASTING IMPRESSION 14
POLISH 12 | VALUE 12
COMMENT Very moreish – cute!

If you are the sort of person who cringes at the sight of a bug, then don't play this game, it's full of creepy crawlies of all shapes and sizes, from small ants to large wasps, flying spiders (wearing helicopter hats)and very large sinister looking spiders, which can kill you with one touch.

Before you meet any of these wierd and wonderful creatures you will have to start the race; yes, a race. You play the part of a maggot which looks remarkably like an inch-worm, lining up at the starting line with another maggot, the beetle fires his starting gun and the race is on.

If you follow the other maggot you can explore most of the scrubland where you can pick up various helpful things such as ant spray, a parachute (?), and a lot of food and drink which is lying around waiting to be eaten. Some things (such as cups of tea) can only be eaten if your energy has dropped to half its level. Choose your object carefully, only one can be carried at a time.

If you've had enough of the scrubland then you can go to hell; that wasn't meant to be an insult. Hell is a part of the game, if you can find it you will come across some entirely different layouts and graphics but, this time, there is gravity: so watch out.

There are other areas which you can find and explore while trying to win the maggot marathon: the Underground, which leads to Hell and certain death. In the mansion, opening doors with the correct keys will lead to very interesting places, one of which is a planet's surface.

The graphics used in the game, such as flying spiders, are very good and can be funny at times. The amount of different screens makes the game very playable, enjoyable, and more importantly, addictive. I would recommend this to any child between the ages of 8 and 80.

PAWS



AUTHOR Artic
PRICE £7.95
GRAPHICS 12 | FIRST IMPRESSION 9
SOUND 0 | LASTING IMPRESSION 15
POLISH 11 | VALUE 14
COMMENT You don't have to be a cat lover – but it helps.

Well, what have we here? This could be the 'purrfect' game for all cats and their pet owners. In Paws you are placed in the puss 'n' boots of a Tom cat who is fighting a running battle with the local pack of dogs; Bulldog Billy and Co. who have decided to kill you.

To have a chance of survival, you and your 10 kittens have to combine your catoplexic energy which frightens the dogs so much that they give up for the night.

Unfortunately for you, your kittens have other ideas and, being mischievous little beggars, they have run off to play so you have to go out and wander through a maze of woodland, scrapyard and town, find them and return them to home before the dogs gather enough strength to kill you. However, not having a mouth the size of a JCB bucket you can only carry one at a time.

You can delay the gathering of the pack by killing the dogs in paw to paw combat which you always win, or by firing a fluffball at them. You can also stun them by leaving deposits of catoplexic energy, which to me looks like something that pussycats fertilise the flowerbeds with.

All this pussy footing about expends you strength and stamina so you have to eat and drink various objects. You must have a digestive system of steel because these include balls of wool, clockwork mice and goldfish complete with bowl.

If you succeed in gathering all your kittens or kill so many of the dogs that the pack cannot form, you get a bonus and go on to the next level which is just the same but with more dogs.

To help you in your battle there is a map of the town which also shows where the dogs and your kittens are.

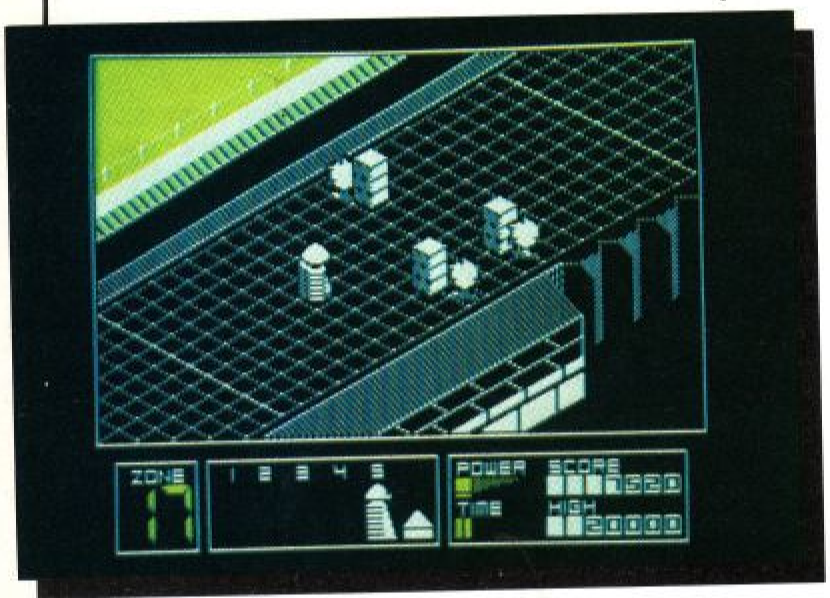
The most remarkable thing about this game is the sound - there isn't any. Not a pitiful mew or growl or purr or anything. Utter silence except the burble of your Arnold thinking to itself. The graphics are above average for this type of game, the kittens are cute and you move with feline grace that is a pleasure to watch. My main complaint is that the movement of the podgy cat is slow.

This game is very simple, very addictive and is suitable for kittens of all ages.

HIGHWAY ENCOUNTER

Comparison between Highway Encounter and the two Ultimate games (Nightlore and Alien 8) is inevitable. They all have in common amazing 3D graphics with the ability for the character that you control to shift the scenery around in order to complete the task in hand. Although I might claim to be the world's greatest Ultimate fan I am moved to say that this Vortex program actually manages to surpass both of these.





AUTHOR Vortex
PRICE £8.95
GRAPHICS 19 FIRST IMPRESSION 19
SOUND 12 LASTING IMPRESSION 16
POLISH 19 VALUE 18
COMMENT Different, fun + addictive

Unlike the large maze of rooms in the other games, Highway Encounter consists of a single road along which one must attempt to take the detonation device that will put paid to the enemy, along with as many of your pals as will be needed along the way. Your travels start in zone 30 and your mission, should you choose to accept it, is to get at least one of your men and said device to the middle square in zone 0.

One departure from the Ultimate themes is the addition of fire power - this is very satisfying for a hackneyed old blast fan. Three shots are allowed before the short delay while your laser is recharged, so it's not just as easy as continuous blasting (a la Defender). Not only can the fire power be used for despatching the foe, but also to rearrange the scenery.

One of the first screens encountered has a line of barrels right across the road, so the first task is to blast a couple off to one side to allow the currently active Vorton (that's you) through. It's a good idea at this point to leave your other four lives and the Lasertron trapped on this screen while you continue up ahead to clear a path and kill all the nasties who would just love to return the favour (to you or one of your metal mates). The heathen masses come in five fruity flavours. Manic pawns shift about like there were no tommorrow but tend to stick to straight lines till they bump into something. Triffid like eyes on stalks that lazily meander about but are just as likely to catch you off guard.

On several screens, there are spikey balls that keep to fixed paths either horizontally or diagonally across the road - barrels and blocks from either their screen or a previous one must be moved into place to trap them up against the edge of the road in order to leave the central path free as it is the only line that the Lasertron can move along. Probably the best form, for latent Dave Allen fans, are the wide mouth frogs that come straight for you and finally, the extra-terrestrial flying saucers that cast convincing shadows and are by far the most ferrocious of the lot.

As well as the barrels that litter the highway, there are blocks that disintegrate when hit (usually allowing the escape of some of those fixed path baddies). You'll also find the solid blocks that cannot easily be moved by pushing (unlike the barrels), but which must be shot to move only a small distance. Glass blocks are totally immobile and just serve to hassle you when you're trying to swing round to catch that flying saucer that has just passed you and is on his way back to easily pick off one of the gang. Squares on the grid like surface of the road that have a textured surface will not allow the Vorton to progress, but will only too easily let one of the more ethemeral baddies by.

There are also flickering flames that inevitably mean instant death. On one particular screen, there is a gap between two of these that is only one Vorton wide, so it's a good idea to get past this one with at least one spare life (because the spare men automatically push the Lasertron up the middle until their path is hindered, unless your active man is more than a couple of screens in front). While trying to solve the intriguing puzzles faced in making a safe path through a screen, you can take a moment to wonder at the detail of the scenery on either side of the road (fields of various veg., trees, water that the road bridges, etc., etc.). As well as the current chunk of highway, the screen also contains details of which zone you are in, which of your five lives are still going concerns, whether the Lasertron is on the move, the number of shots ready for firing, current score, high score and most infuriatingly, time.

The time limit is just enough to get from zone 30 to zone 0, but if you have to spend a little extra in one or two of the screens along the way (shifting barrels, blocking spikes or just plain despatching the alien hordes) then you can be pretty certain that the clock will beat you before the opposition do. To date, my best performance has been to reach zone 2 and this certainly wasn't through lack of practice, though I know it can be done as someone else in our office can testify.

COVENANT





AUTHOR: PSS
PRICE: £7.95
GRAPHICS: 16 FIRST IMPRESSION: 17
SOUND: 12 LASTING IMPRESSION: 18
POLISH: 18 VALUE: 18
COMMENT: A GOOD BLAST!

It isn't often a game appears that one would willingly play for hours on end. The last such games were the two from Ultimate. However, 'The Covenant' from PSS is such a good game that you have to keep returning to it for another go. In essence it is really a drive round the maze and get the right objects sort of a game, but it goes much deeper than this. The first thing that sets this apart from some other run of the mill games is the size of the sprites and in particular, the character that you control and his craft. Every location is colourful to the point of being a little over the top and your vehicle occupies about four by four Mode 0 character squares - to call this big wouldn't begin to tell the story - its absolutely ginormous. I will just mention the one small fault of the program at this point - that is that the movement of this huge sprite is not synchronised with the frame flyback (presumably because it couldn't be refreshed that quickly) so the net effect is that it does flicker a little when it is moved. I don't think, however, that this detracts from the game and can largely be ignored.

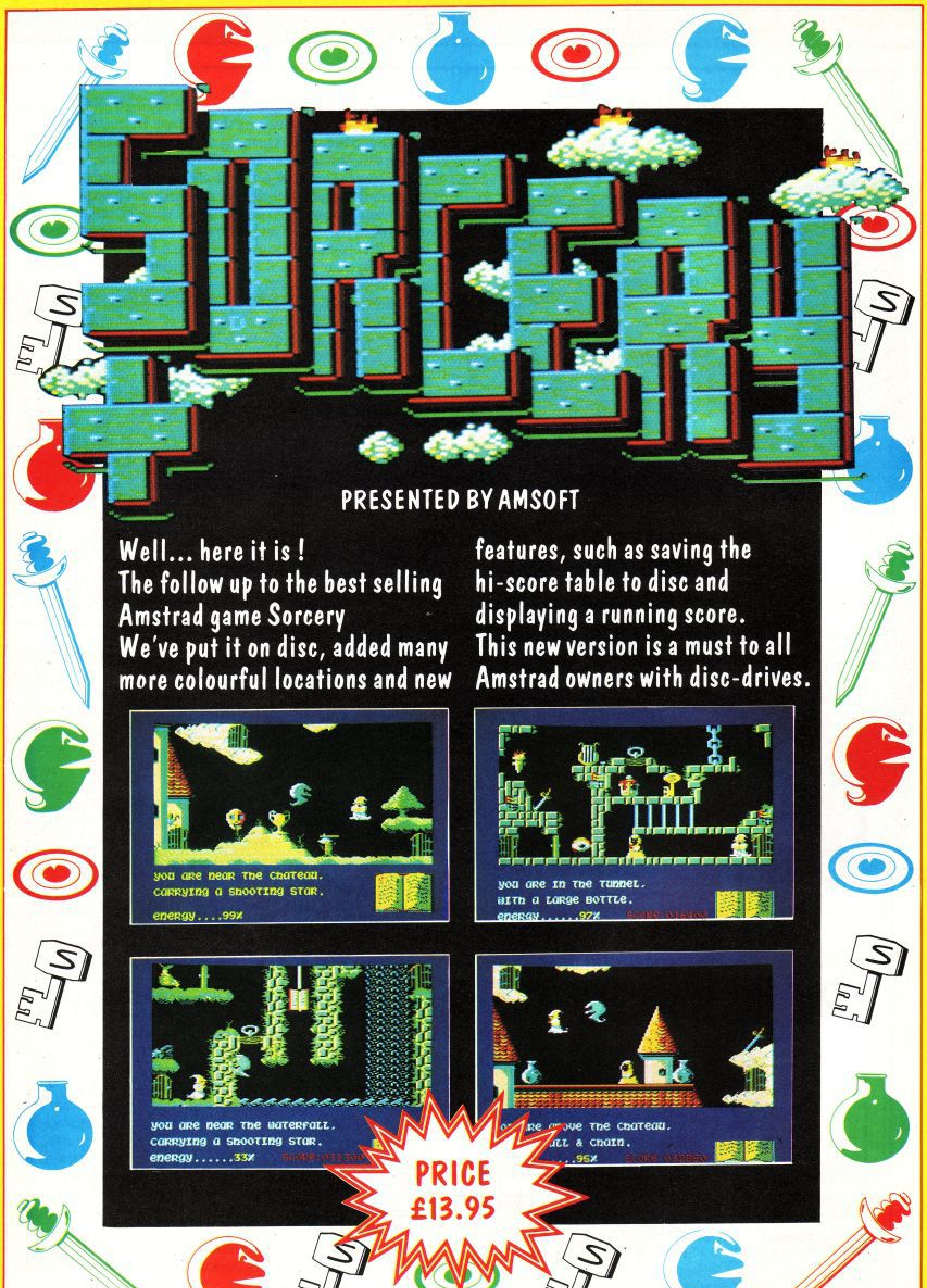
The 256 locations in the game are divided into 64 four room locations. Within each there will be one key, one 'antidote', one piece of a scroll and one energy point that will either replenish or diminish your remaining energy (a bit like the cauldrons in Sorcery). Your task is to first locate the antidote, which is then picked up by leaving the ship (at the press of the 'fire' button) and walking over it. Once it is in your possesion, you may then fire at the particular type of nasty that inhabits this particular four room section. Early in the game, there is only one baddy per room (four in the whole four room block). But later on there may be up to three per room. If you hit one, he will fall to the ground stunned for a short while. Before he comes round, you must return to the ship, re-enter it ('fire' button again) and drive over the helpless soul. He will then be sucked up into your cargo hold.

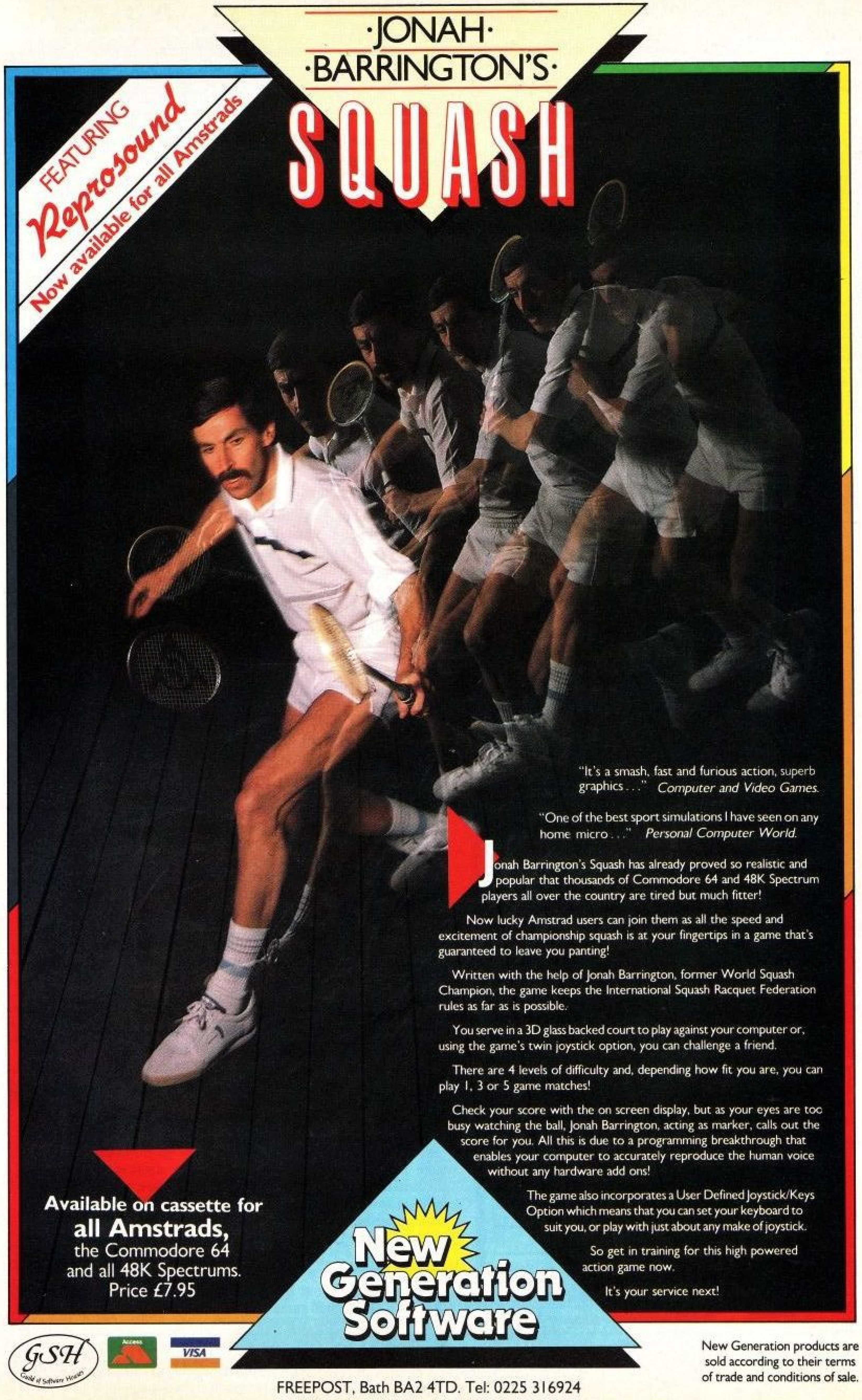
Having captured the baddies from all four locations in a section, you may then, with the aid of a key that will have been left lying in one of the four locations, go and pick up the piece of scroll - this is picked up in the same way as the 'antidote' and the key were. Picking up the scroll then unlocks any doors out of a section and replenishes your energy. The amount of energy and other helpful information can be shown at any time by switching to a second screen by hitting the space bar. The energy you have is shown by three pumping hearts that change colour as energy becomes depleted. It is very important to keep checking one's energy, as loss of all of it ends the game. Energy is drained by contact with the nasties, prolonged movement outside your craft and being hit by your own shots which ricochet off the walls. If the energy situation becomes desperate, the border changes from black to blue - at this point it is a good idea to get to the nearest positive energy point as soon as possible.

Every group of four rooms has its own type of baddy (64 in all) and each type has several frames of animation. Having completed a section, one must negotiate the interconnecting room to the next section - these are all identical and have tongues of flame projecting horizontally from the walls, while acidic drops drip from the ceiling -contact with any of these gobbles energy at an alarming rate.

One of the drawbacks I can see with the game is that the layout does not change, so that once completed, it might loose some appeal. Anyway, before I found the infinite energy POKEs, I never managed to get more than about a third of the way through and that was after many days trying. The current position may be stored on tape and later re-loaded as it would take several hours to complete the game at one sitting. As the pieces of scroll are collected, they fill in a small section of the whole scroll, which occupies most of the information screen. Only by completing the game is it possible to see the whole thing, which, like the rest of the game is very colourful and well designed.

In conclusion, I would not hesitate to go out and buy this game, it has certainly provided an old hack with as much entertainment value as any game I can remember.


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RAID (OVER MOSCOW)



AUTHOR US GOLD
PRICE £8.95/£13.95 (Disc)

GRAPHICS	12	FIRST IMPRESSION	8
SOUND	7	LASTING IMPRESSION	14
POLISH	12	VALUE	14

COMMENT TAKES TIME TO MASTER

This game really had me foxed for a while. About eighty other aircraft became insurers' liabilities before my first one flew out of the hangar.

This is a cross between War Games and Zaxxon. The scenario starts off with a satellite's eye view of a calm, peaceful world. Missiles spring onto the scene (from the East, naturally) and then you, being a patriotic and peace loving soul, decide what to do about it.

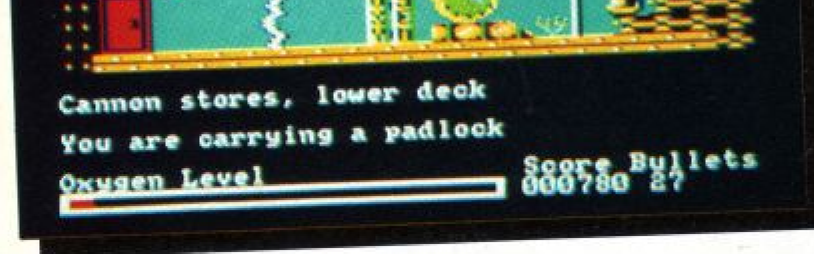
Pushing the fire button (there is a keyboard option) produced a promising view of a hangar filled with lots of little yellow planes. The idea, I suppose, is to use these planes to stop the missiles from hitting a certain large Western landmass. One of them suddenly shot forward and headed for the hangar wall. With a little deft wriggling of the joystick I managed to speed it up and send it spinning into said wall, exploding like an egg in a microwave oven.

Eventually though, I managed to get a few planes out of the hangar and then it was back to the satellite. Guiding a little white dot to the launch silo of the dastardly commie pinko missile causes the screen to switch to something very Zaxxon-like. There, you and your shadow fly through obstacles (the plane banks beautifully). Turbo-charged tanks, missiles and a few blastable objects all look vaguely familiar if you have played Beachead. The sound effects sound very like they are courtesy of Harrier Attack, after the attack.

If you survive this lot, you face a selection of enemy silos shooting at you. There are also commie planeskis which try to shoot you down and try kamikaze tactics when that fails (if it does). Clever guns in those silos, they only blast you, not the opposition. I think that the idea of this screen is to blast the ports in the silos but there is a countdown on this game and I ran out of time and it was (iron) curtains for me.

A great game for arcade veterans and recently expelled British diplomats.

THE DEVILS CROWN



AUTHOR PROBE SOFTWARE
PRICE £19.95/£13.95 (Disc)

GRAPHICS	18	FIRST IMPRESSION	19
SOUND	17	LASTING IMPRESSION	19
POLISH	18	VALUE	18

COMMENT GOOD GAME
GREAT VALUE FOR MONEY

After many years of research you have located the sunken ship and are trying to recover the treasure. Fish and ghosts of dead pirates, however, have other ideas. You guide a sort of open topped mini-sub around the ship, but you need to keep topping up your oxygen supply which diminishes on contact with the myriad of fish in the ship. You also have a gun to shoot the fish with, but it only has a life of fifty shots before you have to find another gun. In order to collect the treasure, you have to complete a variety of tasks beginning with replacing three flashing bells with three steady ones.

The whole game is very colourful and somewhat reminiscent of Sorcery. It does, however, have qualities all its own; when you enter some of the rooms, they are dark and all you can see is yourself, the fish and the ghosts. You need to be carrying the shiny lantern to see anything else, although you can feel your way around the room to another exit, if you know where it is.

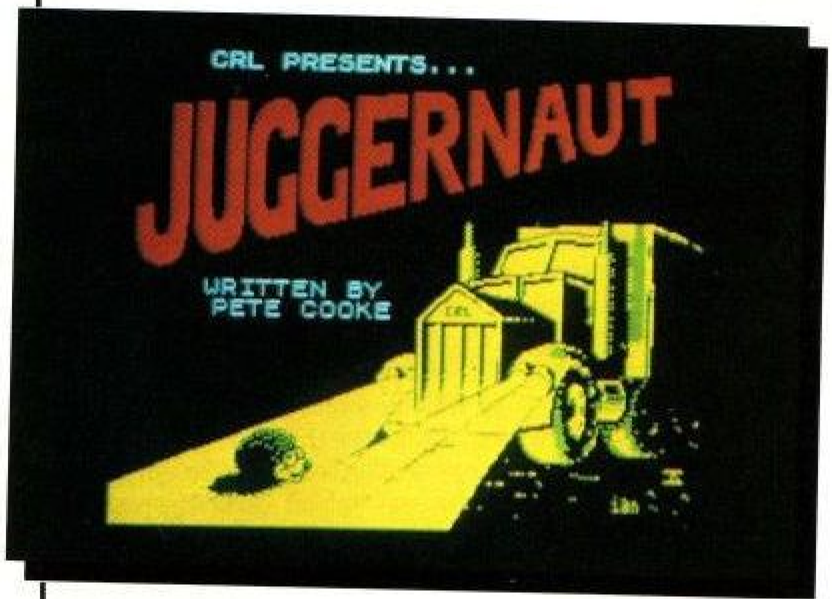
The ghosts are a nuisance; if you touch one when you enter a room, and it is very difficult not to, they will take the object you are carrying, and swap it for another one and then disappear. This is sometimes useful if they give you a shiny lantern, a gun, or oxygen. This is not so useful, however, if they take a lantern, or a golden bell or if they give you a Jolly Roger flag, which kills you with curse. You have to watch out and not try to shoot a fish when you are near a Jolly Roger, because when you pass over an object, the fire key swaps what you are carrying with what was there.

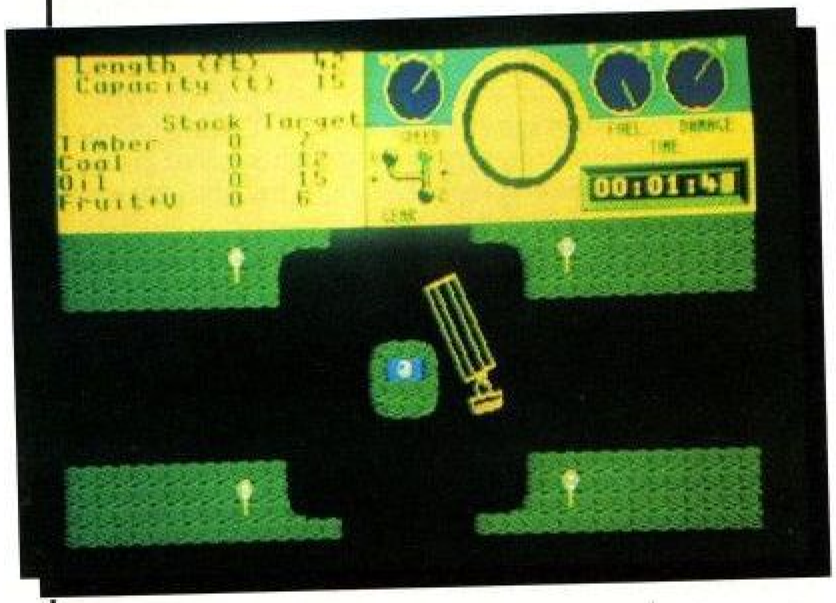
Although the game play is similar to Sorcery, the graphics are more chunky and colourful rather than detailed and pastel shaded. They do, however, have some nice touches; such as the eyes in the pictures on the wall that move, a parrot that keeps on looking around and the clock that has a minute hand that whizzes around at a rate of knots. You are also treated to a jolly burst of the sailors' hornpipe when you pick up the musical harp. The music before the game begins is baroque, organ-like and uses all three voices.

I really like the game. It is sufficiently different from Sorcery to stand up as an original game in its own right. Recommended.

JUGGERNAUT

CRL have always struck me as a bit of an unknown quantity, some of their programs are brilliant (e.g. Rocky Horror) and some are down right atrocious (e.g. second thoughts, I'd better not name names). However, I am pleased to announce that their latest, Juggernaut, fits quite fairly and squarely into the first of these two categories.





AUTHOR CRL

PRICE £7.95

GRAPHICS 12 FIRST IMPRESSION 11

SOUND 12 LASTING IMPRESSION 17

POLISH 15 VALUE 16

COMMENT HEDGEHOGS BEWARE!!

To say I'm hooked would be something of an understatement, like my peers before me, I have charcoal pizzas to testify to this fact (they burnt while I played). In this game, you're cast as the driver of an articulated lorry and so it is bound to appeal to all Amstrad owners because it is a well known fact that they are all lorry drivers. Keys can be defined, so that the default keyboard controls can be changed if a joystick is available. Virtually all the options from the various menus in the game are picked by moving the highlighted icon to the picture you wish to activate, then pressing the fire button. So, for instance, the introductory menu allows you to get on with the driving, set the length of the lorry, practice, see the high scores or define keys.

Having picked the drive option, you are first told which company you'll be working for (though this is irrelevant, it adds a bit of local colour). You are also shown a very small scale map of the town around which you will drive, the home depot indicated by a small H. Pressing Fire again gives another list of iconic options which allow starting, phoning (for directory enquiries), loading/unloading, refuelling, pausing the game and resigning. It's probably best to get straight down to business by picking the start icon and pushing the fire button. A plan view of the depot and your lorry in the loading bay appears in the bottom two thirds of the screen, while a reminder of the stock that must be returned to this home base occupies the left third of the top segment and the rest of the display shows the controls in the cab of the lorry (speedometer, gear change, very large steering wheel, fuel guage, damage indicator and the time of day). The damage is increased by hitting the kerb or jack-knifing. The time is shown using rolling digits.

Having selected first gear (unfortunately, there are only two forward and one reverse, but I suppose we lorry drivers can't have everything), it is possible to accelerate away and continue on until a screen is reached in which a phone box appears. The lorry must then be stopped so that it is possible to return to the map screen, which has all the options including phoning. My major niggle with the whole game is that to return to the map, the S key must be hit, so the game cannot be wholly played on just a joystick. Having picked the phone icon, a very realistic warbling ringing tone is heard, then a screen with 6 icons appears.

There is one for each of the four commodities that must be located, for pick up, one for garages that allow refuelling and repairs and one to hang-up. If the fuel icon is picked, then all the garages on the small town map are high-lighted. The same is true for any of the commodity suppliers. Having remembered where they all are, you can hang-up and drive on to the first destination. It's usually a good idea to start with a garage as the game starts with only half a tank of diesel. At any time, if you get a little lost, it's possible to come to a stop and hit S to see the map again (your position will always be high-lighted). If you're doing more than 30 when you hit a screen with a police station, then a speeding fine will be incurred, this will reduce the final score.

As you motor along, it is very important to make sure that the front end of the cab is exactly perpendicular to the edge of the road or the lorry will start to veer off towards the edge, almost certainly leading to damage. Turning at junctions and worse still, roundabouts are very much an accquired art. It's best to poodle along until you've got the hang of it. However, if you think turning is difficult, slam it into reverse and just try to back it into a loading bay. This is where you really find out what articulated language really consists of. A tip to all would-be truckers is to always go for the longest lorry. While it is more difficult to control (and you can probably say goodbye to reverse until you've played the game for some time) you can almost always carry a complete load of coal, oil, timber or fruit so that only a single trip will be needed to each supplier.

All in all, I'd say this is a very classy game and addictive just ain't in it. Must dash, I've got to get out there and pick up another 7 tons of bananas (or is that where I'm going?).

CODENAME MAT 2





AUTHOR Domark
PRICE £8.95
GRAPHICS 12 FIRST IMPRESSION 10
SOUND 10 LASTING IMPRESSION 14
POLISH 11 VALUE 12
COMMENT ONLY WORTH THE MONEY IF YOU MISSED MAT 1.

Back in the early days of the machine, the first game I ever bought was Codename Mat. In this game, you were given the task of ridding the solar system of the dreaded Myons before they reached Earth. At the time, the game was notable for the fact that it provided very fast 3-D combat sequences and started an almighty argument about which way up the controls should work (I still maintain that something attempting to simulate flight should use controls in the same orientation as an aircraft -which it did). One of the major weaknesses of the game was the warp sequence which a lot of people found quite tricky (though it was really quite easy after a little practice).

Personally, I found the game a bit too simple and could complete it every time. Now, a year or more later, along comes Codename MAT 2. The question is: 'How has it changed?' An immediate answer to this would have to be: 'Not very much.' However, after playing the new version for some time I would concede that is probably a much better game, though it is questionable whether it would be worth adding both to one's collection of games. Warping is infinitely easier and the whole game is much more playable.

This time around, the task in hand is to keep the supplies of an important mineral flowing. This involves defending rows of sattelites in the supply chain. Old MAT fans will be pleased to know that the five speed control keys are the same, the most useful of which will probably be 4 and 5 which take the ship to 30% and 100% respectively. As before, the ship has shields that must be switched on at the start and which it is unwise to switch off again -the reason why this tedious task has not been automated eludes me. In the original, sector scans, long and short range scanners and quadrant maps were given on separate screens, this has been improved to show them on a small screen on the control panel, which appears much more realistic. The old business of trying to determine the enemies position using digital range, offset latitude and longitude meters has been replaced by a much more user friendly battle computer that gives a bar graph for range and an X-Y scan showing which direction to steer to bring him into your sights, colour giving an indication of whether he is in front or behind. The fighting is just as zappy as before and is improved by the choice of slow and accurate plasma bolts or fast firing lasers. There appear to be many more ship designs than before, though only one type is encountered in each wave - I can't decide whether each have their own speed and movement attributes, as was the case in the old game. The idea is to kill off all the Myons before they can nobble the one of the four rows of satellites. At the end of each attack wave an opportunity is given to either repair any that are damaged or to move them about to maintain as many filled rows as possible. In fact, the strategy while fighting is to take on those craft that are most likely to break another link in any particular row. Inevitably, damage will be sustained during fighting but unlike the old game when one could fly to a nearby planet for repairs, your ship contains two droids which can be set to repair the most needy mechanism. This continues as a background task - a message on the console indicating when a system is back to full health, when the droids may then be re-deployed. The long and short range scanners operate in the same way as in the old game (though I'm not sure how many people understood them then).

All in all, the game appears to be a little better than the original, but a bit similar and not a huge improvement - this is a shame, because there have been a whole heap of good games in the last year which do tend to make this one look a little dated. However, it is pretty reasonable for a good blast, even after a tough testing I still remain quite proud of the fact that I got to attack wave seven in my first go.

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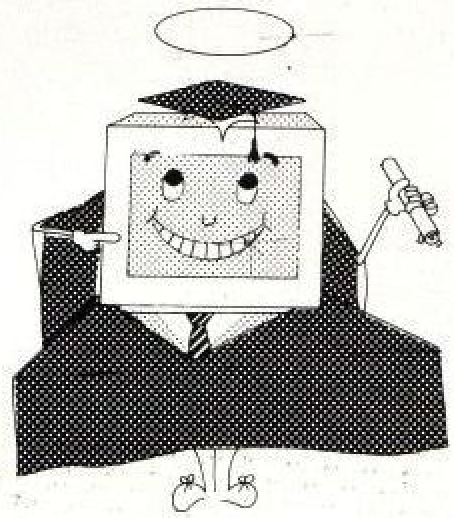
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Operating CP/M

Simon Craven looks at CP/M and explains why you need an operating system

You've all heard of CP/M: a few years ago, the standard question that anyone asked about a business microcomputer was "Does it run CP/M?". These days they ask "Is it IBM PC compatible?", which just shows that fashion is as big an influence in the world of computers as it is everywhere else. CP/M is currently unfashionable in the big league of business computing, but it is becoming very fashionable indeed in our kind of computing: that is, using relatively inexpensive personal computers for fun, interest and useful tasks which are every bit as sophisticated as the things most business micros spend their time doing (even IBM PC-compatibles).

CP/M is one of the most successful personal computer operating systems. Unfortunately, it is a lot harder to grasp the principles of CP/M than it is to get your mind behind Basic as a way of conversation with a computer. This isn't really CP/M's fault- it was designed when memory was very expensive, and as a result almost everything it does is aimed at using as little of the computer's RAM as possible.

If you have entered the world of computing through the usual home computer route, you are entitled to wonder exactly what an operating system is and why you have never used one up to now. The answer is quite simple: up to now, you haven't needed to. The typical home computer has a version of Basic in ROM, so that it goes straight into Basic whenever the power is turned on. You can usually load and save programs on tape or even disc, but everything you do is done from within the Basic interpreter.

Discovering an Operating System

The first hurdle to overcome is your mental picture of a computer being something you talk to using Basic. This is difficult at first - the version of Basic you use is what gives a home computer its personality. However, that personality is merely a mask. By replacing a single ROM chip the personality could be changed completely, yet the hardware would be identical. Think instead of your computer as a bundle of components: a central processing unit which in our case is the Z80; a bundle of RAM which in our case is 64K (OK, 6128 and 8256 users, we'll come to you later), a terminal (the physical screen you look at and keyboard you type on) and a disc drive.

That is virtually all the hardware you need to make a computer. However, if you want to make it usable, you must incorporate some controlling software to co-ordinate all the bits and pieces and give you, the user, some sort of computer personality to talk to. In essence this is the operating system. On most home computers, this software is the ROM chip which includes the Basic interpreter: all you see is a prompt saying something like

```
Wonder Computer Corp
32K free
Ok
```

Actually this is pretty similar to what happens when you turn on your Amstrad, and you would be forgiven for wondering what all the fuss is about. Well, the Amstrad CPC464, 664 and 6128 all have a Basic ROM chip. The 464 has to have this, because it is intended mainly as a cassette-based machine. The others have the same arrangement to maintain compatibility with 464 software. To turn your Amstrad into a real CP/M machine all you do is type |CPM, upon which the ROM effectively disappears, and the computer has its old personality erased.

On a CP/M machine you are not restricted to using Basic. When the machine is switched on, it is full of empty RAM and there is no resident personality. Well... actually there is a little ROM chip which essentially holds just one command: it says 'Look on the disc drive and load the first thing you find'. The computer obediently starts the drive whirring and attempts to read the disc. If you have inserted the disc containing the computer's personality (the CP/M system disc) it will load this in automatically, and a few seconds later the operating system is running and ready to use. It says something like:

```
CP/M 2.2
(c) Digital Research
A>
```

You are now looking at a part of CP/M which is called the command interpreter. It interprets what you type on the keyboard, and sets the appropriate wheels in motion. If the sign-on message mentions CP/M 3 or CP/M Plus, then that is the particular version you have on your machine. Don't worry about the differences yet.

Built in Commands

When you use Basic, the things you type in are recognised as valid commands and executed, unless you type in something that doesn't make sense in which case Basic says 'Syntax error' and lets you try again. CP/M also has a small

number of commands which live in memory all the time. An example which you might know already is DIR. Type in DIR and hit RETURN, and you will get a DIRectory of all the files on the disc in the disc drive. ERA followed by the name of a file will ERAse that file. TYPE (filename) will display the contents of the file on to the screen, as long as it it a text file. If it is a program file, you will just get a screenful of garbage. If you type in something that CP/M does not understand, it will repeat the line you typed and follow it with a question mark: for example

```
A>hello
HELLO?
A>
```

A› is the prompt - whenever you see this, the command interpreter is sitting there twiddling its thumbs, waiting for you to type something in. It is the equivalent of 'Ready' in Basic.

Remember we said that CP/M was designed to keep memory usage to a minimum? The more commands that the programmers put into the command interpreter for recognition, the more RAM it would occupy. Consequently, most of the CP/M commands do not live in RAM, they live on disc. Each is a self-contained machine code program on the system disc. To run one of these programs you just type in its name at the A› prompt. If it is on the disc, it will automatically load, do its stuff, and vanish from memory. This is why the disc drive whirred briefly when you typed HELLO (RETURN). The command interpreter knew that HELLO was not one of the memory-resident (internal) commands, so it looked to see if HELLO was a program on the disc (an external command).

Let's look at the disc directory again (DIR , remember?). Each filename comes in two parts, the name and the extension.

Name	Extension
DDT	COM
LANGUAGE	COM
SUBMIT	COM

Confusingly, when you list the disc directory, the two parts of the filename are shown with spaces in between, but it is normal to write down a CP/M filename with a dot between the two parts, as in DDT.COM , LANGUAGE.COM or SUBMIT.COM.

The first part of the name can be up to eight characters, and the extension up to three. You have a pretty free choice of alphanumerics, with the provison that some extensions are reserved for certain types of file. Anything ending in .COM is an executable machine code program file (the COM stands for 'command', as this is the format of the CP/M external commands). A .COM file can be part of the operating system, or it might be a completely different kind of program, such as WS.COM , the main module of the Wordstar word processing package.

By convention, any .TXT file contains text, a .BAS file is a Basic program, and a .SYS file is something used to tailor the operating system to any specific needs you might have.

At this stage you know roughly what CP/M does, and how to run .COM files from the A› prompt. The next part of this series will run through the way to use some of the more commonly-used CP/M internal and external commands.

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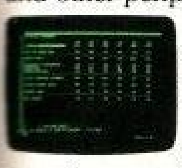
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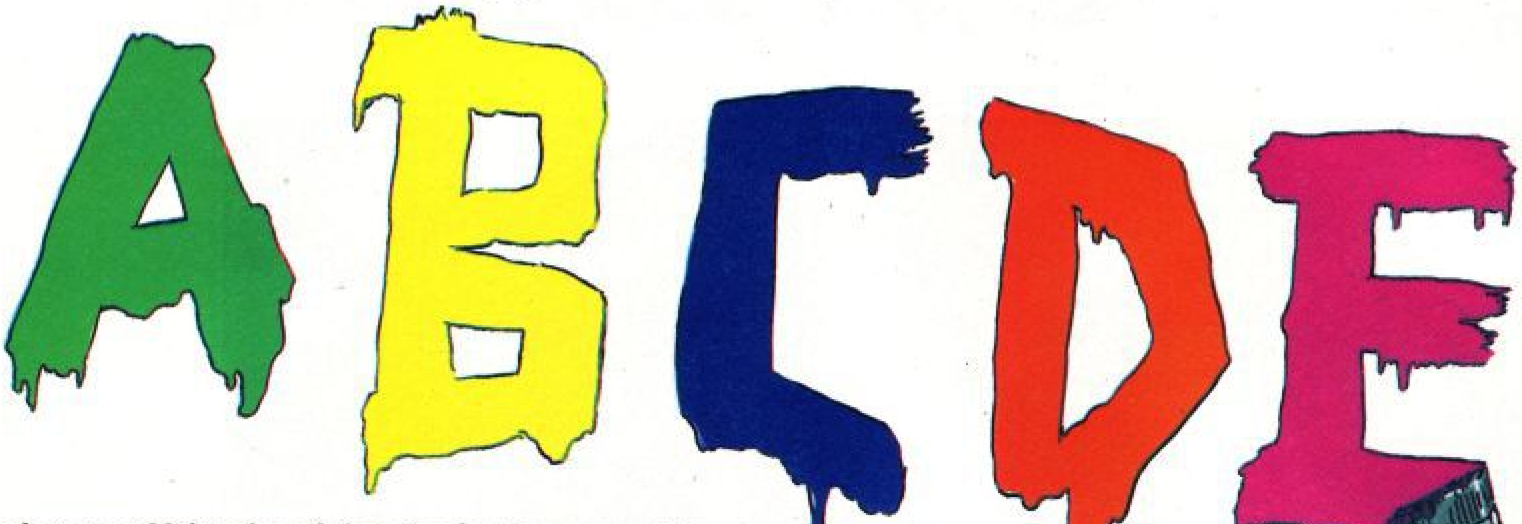
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Chris Wood and his
Amazing Technicolour RSX





How do you get Multi coloured characters on the screen; either at LOCATE coordinates or at PIXEL coordinates? Until now you either had to do it in machine code, which is a bit over the top if 99% of the program will run quite happily and fast enough in Basic. You would have to design several characters which, amalgamated, form the different parts of the character you wanted and PRINT them, in different pens, in transparent mode, one on top of the other. For example, if you wanted a man with a blue body, red hair, and a white face with an eye: you would have one character for his body, one for his hair, and one for his face with a hole for the background to show through his eye, and that's only in mode one. If you were in mode zero you could have to print up to fifteen different characters which is terribly slow.

So, for those of you who want a fast and easy way of putting multi-coloured characters (which are effectively very small sprites) on the screen without resorting to reams of machine code, I have designed two simple RSXes. |MPUT to print either one, or a string of multi-coloured characters at the last print position, and |GPUT to print either a single, or a string of, multicoloured characters at the graphics cursor position.

For either of them you simply input the commmand, followed by a string of numbers, separated by commas. For example:

```
10 LOCATE 10,10:|MPUT,0,1,2,3
20 MOVE 100,100:|GPUT,4
30 MOVE 200,40:|GPUT,5,6
40 LOCATE 20,3:|MPUT,7
```

The numbers after the commands refer not to the normal character set but to another one which you design separately and which I will tell you more about later.

As you can see, both routines are very simple to use and I will explain a few of their minor limitations. For |MPUT, it does not put the cursor position after the last character it prints like Basic, so if you want to MIX Multi and Normal characters you must do a LOCATE command after each |MPUT. For |GPUT, it will put the character at the nearest byte position on the screen and not quite at the pixel position. This means that you can move up and down the screen easily enough but it will only move an eightieth of the screen to the left or right. This limits left and right movement to half a mode one character (four pixels) and quarter of a mode zero character (two pixels). In mode zero this is not too much of a limitation but if you think that it is too jerky in mode one then you could design two or more characters with the shape you want slightly offset in each so that printing them one after the other would give you pixel smooth movement. This is the technique I have used in the small demo program.

Pay the Price

There is a price to pay for all this ease of use: more memory is taken up for each character that is printed.Instead of the normal eight bytes, a mode one character takes up sixteen bytes, and a mode zero character takes up thirty two bytes, but this is not so bad when you consider you might have had to print up to three mode one characters or fifteen mode zero characters to get the same result, only much more slowly. A mode two character still only takes up eight bytes and the routine will in fact work in mode two, although there is little point in trying it as you cannot have more than one ink, and might as well use the normal Basic method.

Using the Programs

First, type in program one, save and run it. If you have made any errors in the data you will be told which line to look at. When the program is running without any errors, save it and reset the machine by turning it off and on again. Now type in the designer program, program 2 and save it.This will allow you to design your characters in whichever mode you require and to save them to tape (or disc).

The designer program is very small and simple as I have found that people prefer to put in their own 'user friendliness' rather than type in reams of someone else's. After telling the program which mode you want, away you go. To guide the cursor around the character, use the cursor keys, and use the COPY key to turn the pen on or off. To change the pen you are using press the 'P' key and enter the new one. To put your character into memory press the 'S' key and give it a number, you can have as many as you like as long as you remember how much memory each takes up. In order to recall a previously saved character from memory, to do some more work on it for instance, press 'R' and enter its number, when you have finished designing them press 'Q' and after asking you if you are sure it will ask you how many to save.Remember, the sprite numbers start at zero so 0 to 7 is eight sprites.

Now, so see the fruits of your labours, you must reset the machine and run this small program:

```
10 INPUT "MODE";MM:MD=1:IF MM <>1 THEN MD=2
20 INPUT "HOW MANY SPRITES";S:MODE MM
30 S=S*16*MD
40 H=HIMEM-1
50 HIMEM=H-S
60 H=HIMEM+1
70 LOAD "",H
```

and load back your sprites.

Now you can load and run the RSX program again. This will move HIMEM and put itself above it and activate itself. You can now use the RSXs and see your sprites appearing on the screen. Don't forget that the |MPUT will not move the cursor position so if you do:

```
|MPUT,0,0,0
```

the 'Ready' message will obliterate your sprites, so add ':PRINT' to the end of it. And remember to put the graphics cursor on the screen with the MOVE command so you can see its characters, like:

```
MOVE 100,100:|GPUT,0
```

Right, now you should have the routines working. I will tell you that it has three methods of printing the characters. You can either just print the characters and rub them out by |MPUTting or |GPUTting a blank character over them. I should tell you to reserve one of your characters if you want to this. Or you can XOR your character onto the screen where it will combine with what is on the screen, in the same way as games like 'Manic Miner' and 'Sorcery'. You can erase it by reprinting the same character. The third method will only print the parts of the character that actually have any ink. It doesn't print zero bytes. Say for instance you only wanted a mode one size character but in mode zero. If you only design half the character, say the left, and leave the rest blank, when you come to print it next to another you will normally get the strange effect of it rubbing out what is on the screen when there is nothing in its place. This method of printing stops happening and means you can print very small characters without a 'halo' around them. This is almost, but not quite, similar to the normal 'transparent' printing mode. This means that you need to use the first method of printing if you want to rub something out with a blank character, otherwise nothing will happen.

To select the methods you simple POKE 5,n where n is:

2 to 255 for normal printing
1 for XOR printing
0 for Transparentish printing.

This means that this routine is compatible with my Extended Trace routine which hopefully you will also have typed in.

To see the routine in action type in the first part of the very small demo program which will set up the characters. Then load and run the RSX program then load and run the second part of the demo program to see a ball moving smoothly across and up the screen.

As a final pointer, the program will run anywhere in memory so if you have designed a different character set with the SYMBOL AFTER command do it before loading and running the Multi coloured characters and the RSX program and all will be well. By the way, if you design your characters in mode one and try to print them in mode zero they will not look the same, or even like two mode one characters.This may seem obvious to some of you but not to others.

Now go out there and write SORCERY++!

What is an RSX?

RSX stands for Resident System eXtension, you can effectively design your own commands and Basic will execute them if they are preceded by a '|' which is obtained by pressing SHIFT and @ at the same time. This allows you to add to and expand your Basic at will.

```
10 'Program 1
20 'Multi-coloured printing RSXs.
30 'by  Chris Wood. 28/9/85.
40 '
50 h=HIMEM-1:IF PEEK(0)=0 THEN GOTO 70
60 POKE 0,0:h=h-192:MEMORY (h-1)
70 lin=1000:add=h:FOR t=1 TO 192 STEP 8
80 chk=0:FOR b=0 TO 7
90 READ a$:a$=UPPER$(a$):n=1
100 IF LEN(a$)<>2 THEN GOTO 370
110 b$=MID$(a$,n,1)
120 GOSUB 350:IF a=0 THEN GOTO 370
130 n=n+1:IF n=2 THEN GOTO 120
140 p=VAL("&"+a$):POKE add,p
```

```
150 add=add+1:chk=chk+p
160 NEXT b: READ a
170 IF a<>chk THEN GOTO 370
180 PRINT "Line";lin;"OK":lin=lin+10
190 NEXT t
200 r=h+9:a=INT(r/256):b=r-(a*256)
210 POKE h+1,b:POKE h+2,a
220 r=h+17:a=INT(r/256):b=r-(a*256)
230 POKE h+4,b:POKE h+5,a
240 r=h+21:a=INT(r/256):b=r-(a*256)
250 POKE h+9,b:POKE h+10,a
260 r=h+30:a=INT(r/256):b=r-(a*256)
270 POKE h+41,b:POKE h+42,a
280 POKE h+63,b:POKE h+64,a
290 r=h+31:a=INT(r/256):b=r-(a*256)
300 POKE h+122,b:POKE h+123,a
310 r=h+194:a=INT(r/256):b=r-(a*256)
320 POKE h+31,b:POKE h+32,a
330 CALL h
340 END
350 a=INSTR("0123456789ABCDEF",b$)
360 RETURN
370 PRINT"ERROR in line";lin:END
```

```
1000 DATA 01,29,4E,21,31,4E,C3,D1, 684
1010 DATA BC,35,4E,18,18,00,18,11, 408
1020 DATA 00,00,00,00,00,4D,50,55, 242
1030 DATA D4,47,50,55,D4,00,00,30, 708
1040 DATA 75,F5,AF,18,03,F5,3E,01, 872
1050 DATA 32,3E,4E,F1,A7,C8,47,F5, 1114
1060 DATA DD,23,DD,23,10,FA,CD,11, 1000
1070 DATA BC,47,3E,02,90,F5,3A,3E, 832
1080 DATA 4E,A7,28,0A,CD,78,BB,2D, 852
1090 DATA 25,CD,1A,BC,18,1B,CD,C6, 910
1100 DATA BB,B7,CB,1C,CB,1D,CD,11, 1055
1110 DATA BC,F1,F5,A7,28,08,47,B7, 1143
1120 DATA CB,1A,CB,1B,10,F9,CD,1D, 958
1130 DATA BC,F1,C1,C5,F5,DD,2B,DD, 1549
1140 DATA 2B,4F,06,03,80,47,79,E5, 680
1150 DATA ED,5B,3F,4E,DD,6E,00,26, 838
1160 DATA 00,29,10,FD,19,EB,E1,87, 930
1170 DATA 20,01,3C,47,C5,E5,06,08, 604
1180 DATA 3A,05,00,A7,28,09,FE,01, 534
1190 DATA 28,0B,FE,02,1A,18,08,1A, 391
1200 DATA A7,28,05,18,02,1A,AE,77, 557
1210 DATA CD,26,BC,13,10,E2,E1,CD, 1122
1220 DATA 20,BC,C1,10,D7,F1,C1,10, 1094
1230 DATA B2,C9,00,00,00,00,00,00, 379
```



```
10 'Program 2 CHARACTER DESIGNER PROGRAM
20 INPUT "Mode";mm:md=1
30 IF mm<>1 THEN md=2
40 SPEED KEY 10,1:MODE mm
50 q=1:BORDER 0
60 PEN 1
70 PEN 1:tt=TEST(x,398-y):LOCATE INT(x/(
   2*md))+10,INT(y/2)+1:PRINT CHR$(203)
80 k$=INKEY$:IF k$="" THEN GOTO 70
90 kk=ASC(k$)
100 LOCATE INT(x/(2*md))+10,INT(y/2)+1:P
    EN tt:PRINT CHR$(143):PEN q
110 x=x-(2*md)*((kk=&F3 AND x<(14*md))-(
    kk=&F2 AND x<>0))
120 y=y-2*((kk=&F1 AND y<14)-(kk=&F0 AND
     y<>0))
130 IF k$="p" OR k$="P" THEN LOCATE 1,25
    :PEN 1:INPUT "Pen";q:PEN q
140 IF kk=224 THEN te=1-(te=1):PEN 1:LOC
    ATE 20,3:PRINT"OFF":IF te=1 THEN LOC
    ATE 20,3:PRINT"ON "
150 LOCATE 20,2:PEN 1:PRINT"pen ";q;"  "
    :PEN q
160 IF k$="r" OR k$="R" THEN GOTO 230
170 IF k$="s" OR k$="S" THEN GOTO 210
180 IF k$="q" OR k$="Q" THEN GOTO 270
190 IF te=1 THEN LOCATE INT(x/(2*md))+10
    ,INT(y/2)+1:PRINT CHR$(143):PLOT x,3
    98-y,q
200 GOTO 70
210 LOCATE 2,10:PEN 1:INPUT"sprite";a:a=
    a*16*md+20000:PEN q
220 c=49152:FOR b=0 TO (2*md)-1:FOR n=0
    TO 7:POKE a+8*b+n,PEEK(c+(n*2048)+b)
    :NEXT n:NEXT b:GOTO 70
230 LOCATE 2,10:PEN 1:INPUT"sprite";a:a=
    a*16*md+20000:PEN q
240 c=49152:FOR b=0 TO (2*md)-1:FOR n=0
    TO 7:POKE c+(n*2048)+b,PEEK(a+8*b+n)
    :NEXT n:NEXT b:GOSUB 250:GOTO 70
250 FOR b=0 TO 14 STEP 2:FOR n=0 TO 14*m
    d STEP (md*2):tt=TEST (n,398-b):LOCA
    TE INT(n/(2*md))+10,INT(b/2)+1:PEN t
    t:PRINT CHR$(143):NEXT n:NEXT b:PEN
    1
260 RETURN
270 LOCATE 1,24:PEN 1:INPUT"Save chars";
    r$:r$=UPPER$(r$):r$=r$+" ":IF MID$(r
    $,1,1)<>"Y" THEN GOTO 190
280 LOCATE 1,24:INPUT "How many";s:s=s*1
    6*md:SAVE"chars",b,20000,s:GOTO 190
```

```
10 'demo part one
20 h=HIMEM
30 h=h-64
40 MEMORY (h-1)
50 FOR n=0 TO 15:READ a:POKE h+n,a:NEXT
60 FOR n=16 TO 31:POKE h+n,0:NEXT
70 FOR n=32 TO 55:READ a:POKE h+n,a:NEXT
80 FOR n=56 TO 63:POKE h+n,0:NEXT
90 DATA 48,115,247,247,243,240,112,48
100 DATA 192,224,248,248,240,240,224,192
110 DATA 0,16,48,48,48,48,16,0
120 DATA 240,240,240,240,243,247,247,243
130 DATA 0,128,192,192,200,200,128,0
```

```
10 'demo part two
20 POKE 5,1:REM XOR mode
30 FOR n=0 TO 640 STEP 8
40 MOVE n,200:|GPUT,0,1
50 GOSUB 140
60 |GPUT,0,1:|GPUT,2,3
70 GOSUB 140
80 |GPUT,2,3
90 NEXT
100 FOR n=0 TO 400 STEP 2
110 MOVE 300,n:|GPUT,0
120 GOSUB 140:|GPUT,0
130 NEXT:GOTO 20
140 FOR z=0 TO 30:NEXT
150 RETURN
```

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Most home computers.

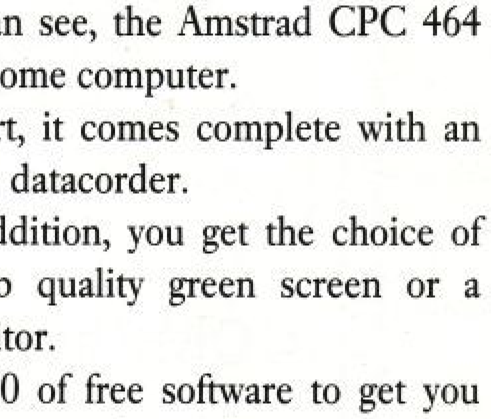
As you can see, the Amstrad CPC 464 is no ordinary home computer.

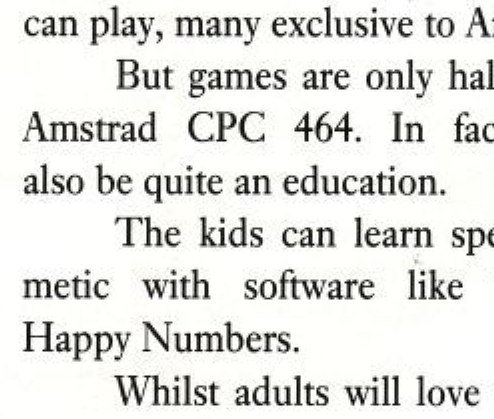
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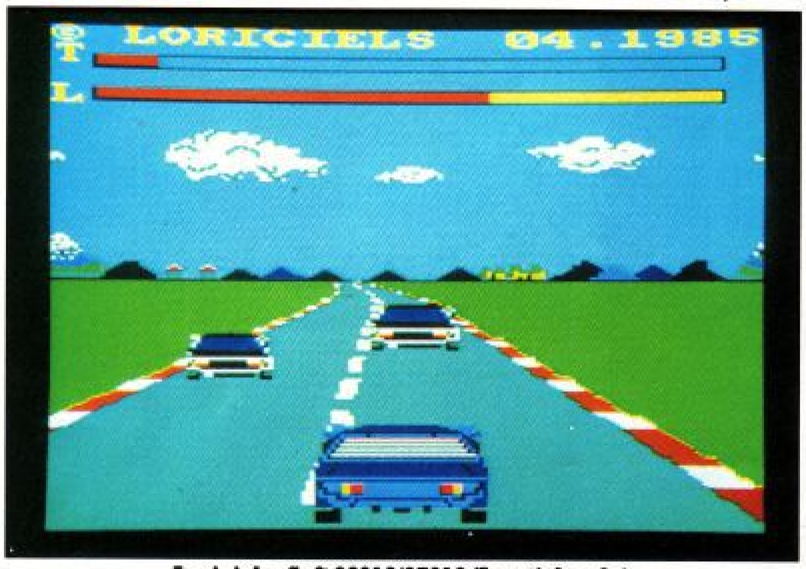
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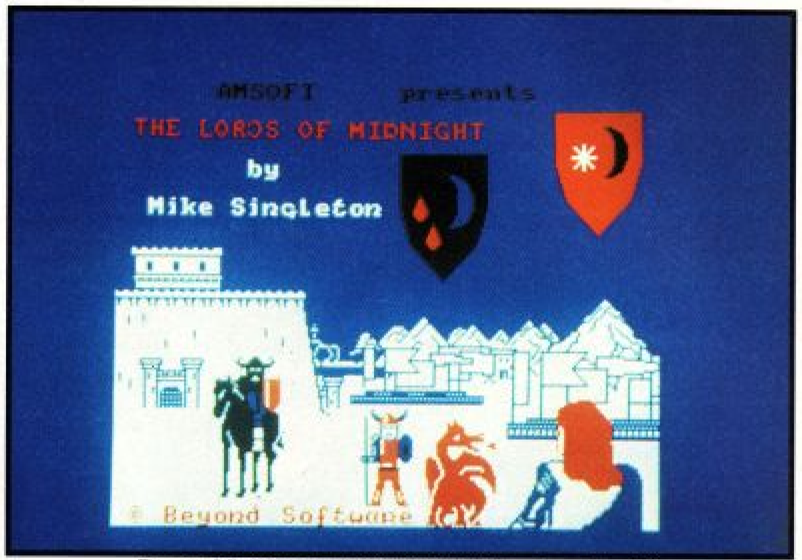


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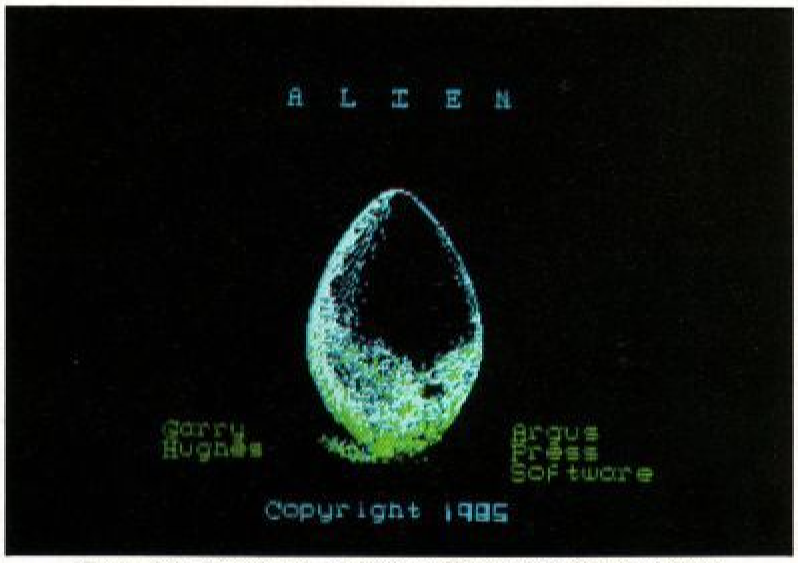


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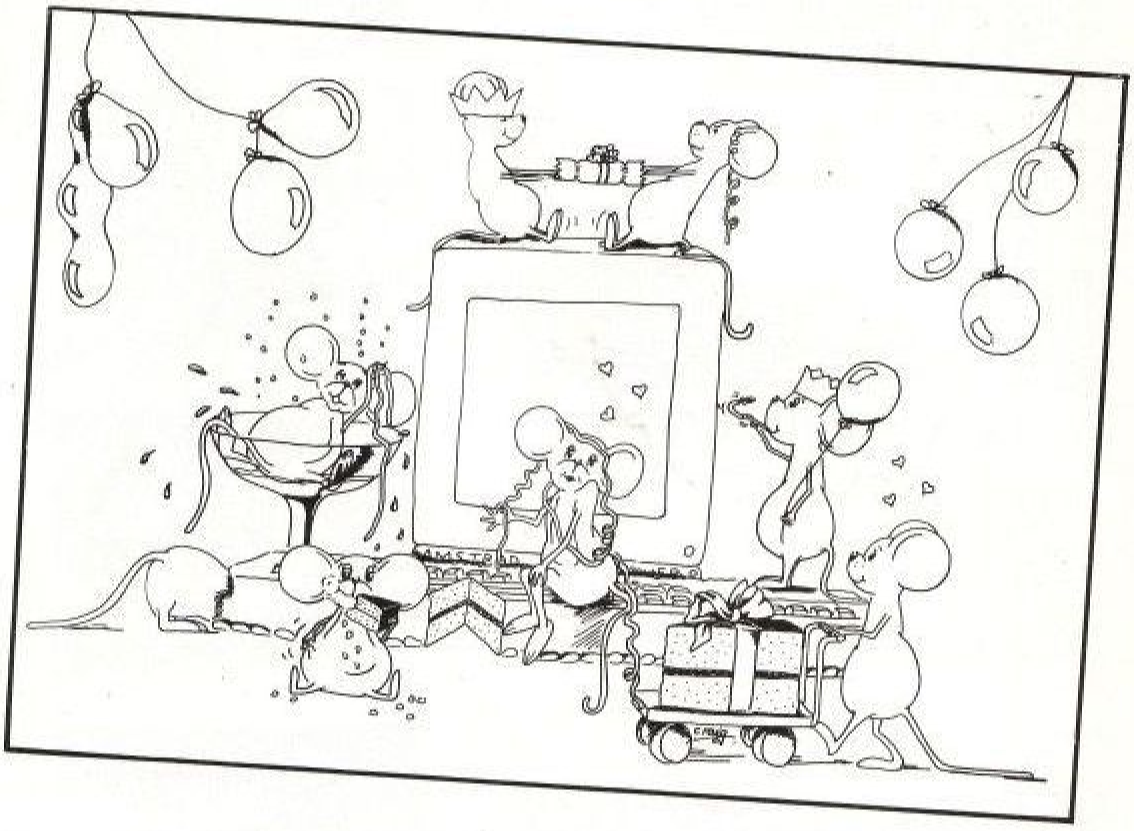
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2 Entries must reach the Amstrad User office by 27th December (remember thé Post takes longer at Christmas).

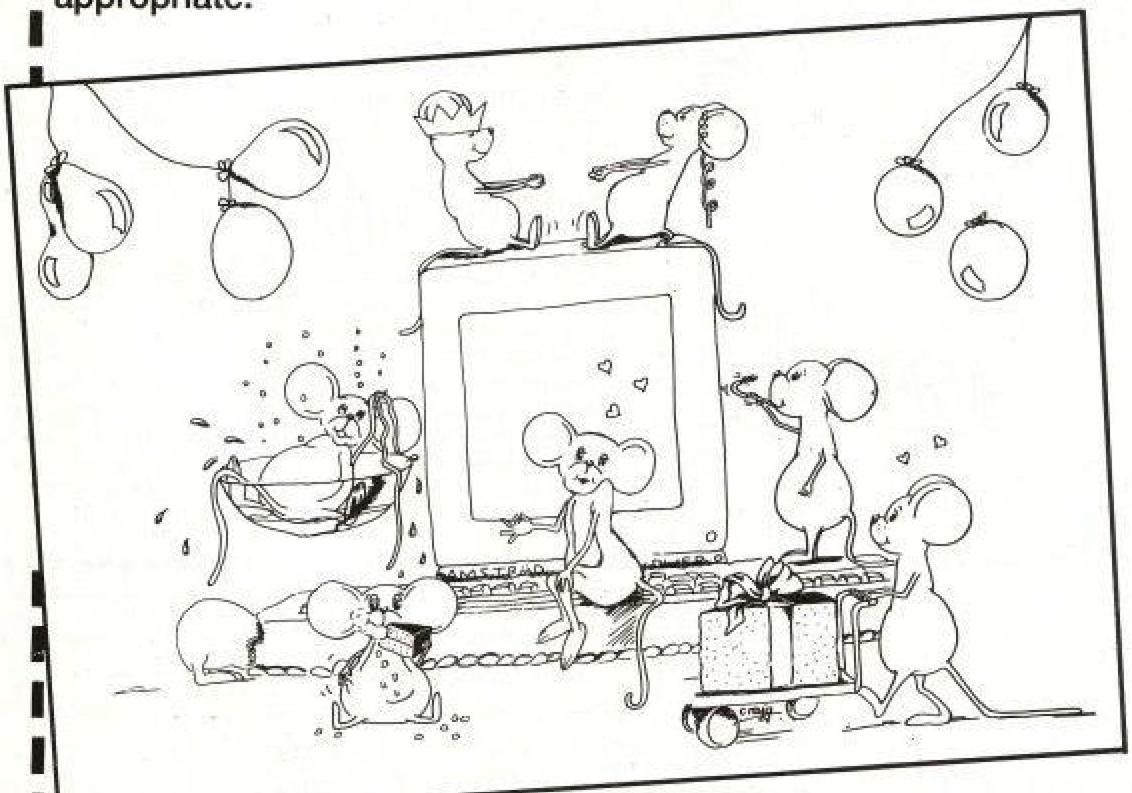
3 Only one entry per person. You may photocopy the form. Anyone submitting more than one form will have all entries disqualified.

4 No correspondenne can be entered into regarding the competition. Entries cannot be returned.

5 The judges' decision is final.

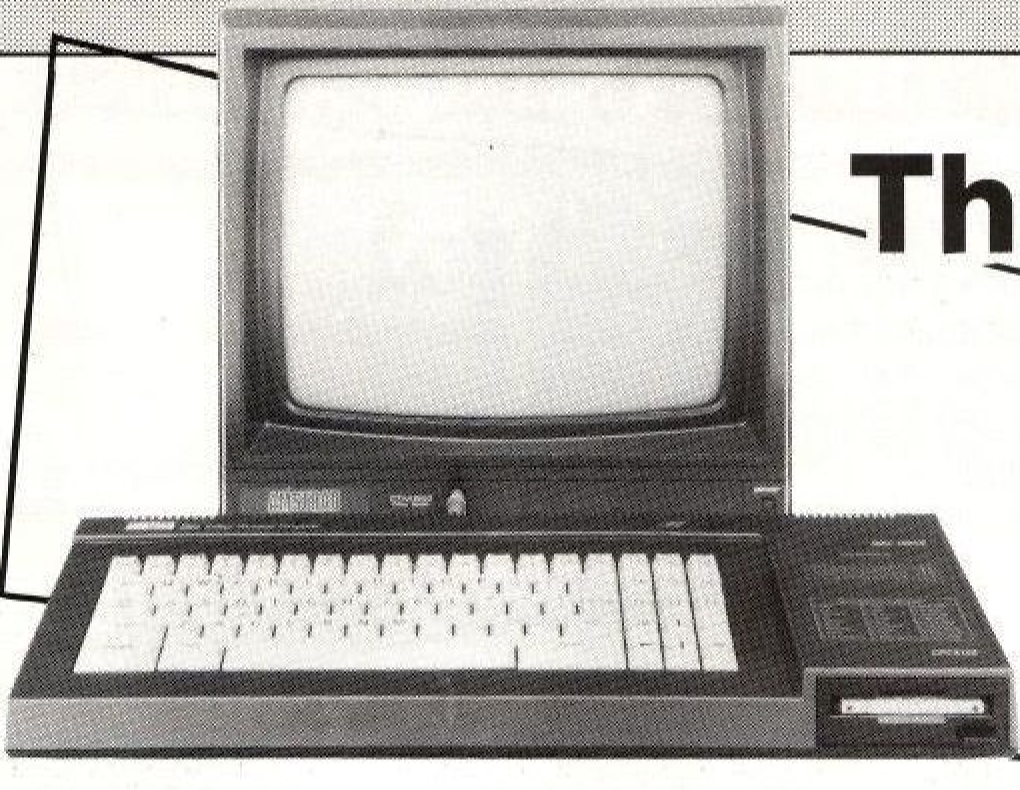
6 No employees of Amstrad, Amsoft or Amstrad User, nor their relatives may enter.

7 Entries should be sent to: AMX Mouse Competition, Amstrad User, 169 Kings Road, Brentwood, Essex, CM14 4EF



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NUMBER OF DIFFERENCES



The Unsung Heros

Part 4

Well, you've heard the story behind the CPC464, this final instalment will bring you right up to date.

After the excitement of the launch of the CPC464 in April 1984, the backroom development was concentrated on finishing off the disc system -which duly appeared in the shops around October that same year. At the time of the original work on the 464, the industry seemed completely infatuated with cassettes -although the 'boss' took little convincing that disc systems were going to be the way ahead when comparing the 10 seconds it took to load Roland in the Caves, compared with the 6 minutes (it seemed longer) on tape.

Prices were the thing, and the only mechanism offering any hope that Amstrad could make the magic retail price point of £199 was on offer from Panasonic. The 3 inch disc saga had begun.

The fact that low cost 3 inch systems offered vastly more reliability and ruggedness then cheap 5 inch configurations was also a factor in making the choice. At that time, 3.5 inch disc systems weren't in the reckoning at all, and the fragility of that particular media was causing concern.

'But it's not standard'

Nor was the price. For a complete disc system with a recognisable operating system, and total compatibility with the cassette system, £199 was quite a show stopper. Various pundits spent many hours musing over the advisedness of introducing the 3 inch disc to a market weighed down with 8/5/3.5 inch systems, and so many different formats within that framework that the use of word 'standard' was meaningless.

However, the 3 inch system had the advantage that it was electrically identical to the 'standard' 5 inch drive mechanism, and that is more than could be said for the confusion reigning in the 3.5 inch disc market at that time.

Some influential observers displayed a disturbing degree of ignorance by comparing capacities, stating that the 3 inch system was only 250K, whereas the 3.5 inch system offered up to 1 MByte. Well, readers, so does the 3 inch system, it's just that the price scheme would have been outside the Amstrad terms of reference for a mass market product. With the PCW8256 and the cost erosion that has occurred, all this is now revealed, although there isn't much evidence of the 3.5 inch Jonahs eating their words.

'Who's standard now?'

As it happens, Amstrad has probably shipped more CP/M80 disc systems than anyone else in the business, and so, de facto, must be regarded as the standard. Given another few months of selling the hugely successful PCW8256, CPC6128 and add-on DDI 1 systems, there will be no argument at all.

Having seen the reaction to a home micro with low cost real disc, the most obvious thing to do was to amalgamate the disc within the computer and extend the basic Amstrad principle of saving costs by putting the whole show together in one box.

It was supposedly a task to be carried out with minimal disruptión, since the PCW 8256 had been conceived about the same time, and was the focus of most attention. However, Locomotive took the opportunity to tune up the BASIC for disc handling, and add on a few extra features that missed version 1.0 for lack of time.

Shortly into 1985, the Spanish distributors, Indescomp, decided that they should have a crack at the USA market if Amstrad wasn't going to have a go itself, and the CPC6128 was commissioned. The 6128 was originally deemed to be impossible, but MEJ electronics eventually found a way around the problems of adding an extra 64K - Locomotive found a way of making use of it - and the project proceeded far quicker than anyone had expected. The price of the parts came down so rapidly as a result of the turmoil in early 1985 that the startling 6128 price at the magic price points of £299 and £399 was unexpectedly possible.

Software

Meanwhile, the software was beginning to flow. The original task of convincing software houses to 'have a go' got easier by the day, and some notable landmarks began to appear. Roland in Time was the first mega game, hotly pursued by the conversion of Jet Set Willy (doesn't that seem like an age ago?).

The substantial operating system documentation (Soft 158) encouraged many programmers to get going -assisted in the utility department by HiSoft's Devpac. HiSoft Pascal was made available very quickly to show just what could be done with the machine and its operating system in the hands of a serious programmer.

Tasman software quickly evaluated the potential of the

system and produced, in the form of Amsword, the best implementation of their Tasword Spectrum WP package yet seen, encouraging some reviewers to go over the top with praise and enthusiasm. In fact, the success of Amsword underlined the relevance of a home word-processor and was influential in the direction of new products.

Companies who had originally told Amstrad to go away were beginning to get interested as they continued to read glowing reports of sales, export markets and general success. With the BBC and Sinclair markets showing signs of the problems that were to follow early in 1985, a number of of software houses were now trying a little harder to hedge their bets.

More and better software appeared daily, and by mid-1985, all the majors were producing new titles simultaneously on 464 format.



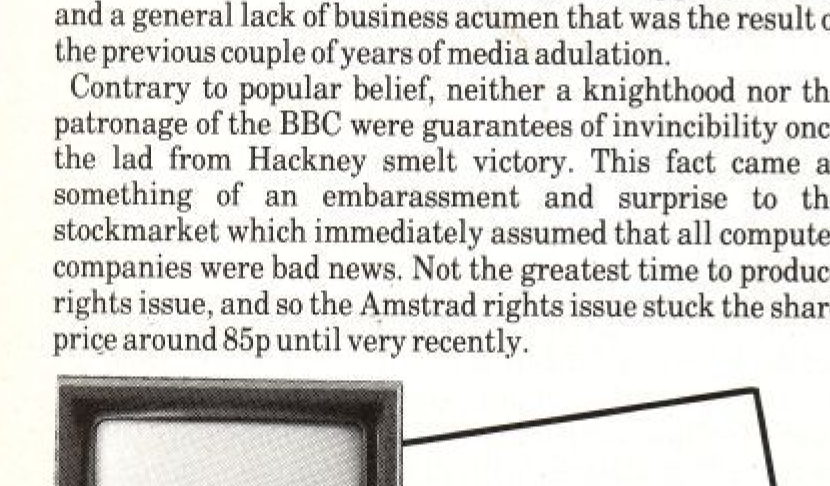
Told you so...

With lashings of uncharacteristic hospitality, Amsoft held a software writers' conference in December 1984 to provide encouragement and general information, hinting broadly that effort on CP/M software would not go unrewarded. Nevertheless, the introduction of the 6128 and 8256 systems seems to have caught most people on the hop, and innovative CP/M software with GSX support is only emerging from one or two places - notably Ian Searle's Software Technology.

It seems no matter how much faith the Amstrad staff have in their product, the general disruption and debacle of the home computer market causes those not so close to the product to be suspicious and cautious about getting too heavily involved. Maybe Amstrad's record of manoeuvrability in volatile markets causes people to be wary that Amstrad might duck out when the going gets tough - but what they fail to appreciate is that the quality of opposition in the computer market was nothing like as sophisticated as in the general consumer electronics marketplace that forms the backbone of Amstrad's expertise.

For Amstrad, competing was getting to be like shooting fish in a barrel. The competition generously helped the general effort by repeatedly shooting themselves in the foot with broken delivery, wrong pricing, slow upgrade tactics and a general lack of business acumen that was the result of the previous couple of years of media adulation.

Contrary to popular belief, neither a knighthood nor the patronage of the BBC were guarantees of invincibility once the lad from Hackney smelt victory. This fact came as something of an embarassment and surprise to the stockmarket which immediately assumed that all computer companies were bad news. Not the greatest time to produce rights issue, and so the Amstrad rights issue stuck the share price around 85p until very recently.



However, it all means that Amstrad seems able to produce new computers faster than Ian Sinclair can write about them. And that's going some.

Back to the hardware

The 6128 was largely a background task, with most effort being spent on the PCW8256. Joyce started life with the screen on end - but for styling and technical reasons, a more conventional posture was chosen. Nevertheless, the basic principle of getting as much as possible into the display was retained, and the very real advantages of the 90x32 screen are causing even the likes of PC suppliers to groan, as the public gleefully accept Amstrad's offering as pure value and utility instead of overpriced, overpowered IBM clones with screens displaying 40% less.

The parts price collapse caused the machine to adopt an all-RAM approach, and although various options had been left open in case the 256K RAM's didn't get down in price far enough, they were not required. In the event, the 112K of RAM disc is one of the most useful 'low profile' features of the whole system, since it allows CP/M programs to simply 'happen' rather than take time loading and running.

MEJ Electronics spent most their time developing the gate array and once again, produced a first time working part. In view of the way in which the software was designed to take control of the hardware, it was essential for Locomotive to have a working example as early as possible, and a very complex simulated system was made available - more complex than the original CPC464 gate array simulation, since this time there were to be fewer external ICS, and no short cuts such as the 6845 CRT controller.

LocoScript passed through several hundred stages of development, and because it is such a complex and totally integrated product, each minor iteration required a complete recompilation from source. But with their usual attention to detail and quality, the final 1.0 version made the deadline and proved to be a great deal more sophisticated and capable than anyone really had dared hope given the relatively short time available.

And in case you are wondering, LocoScript was not the first choice of name, but as mentioned in the brief overview of the PCW8256 in the October issue, all the good obvious and descriptive names have long since been snapped up. Mind you, WordStar doesn't make much sense either, does it?

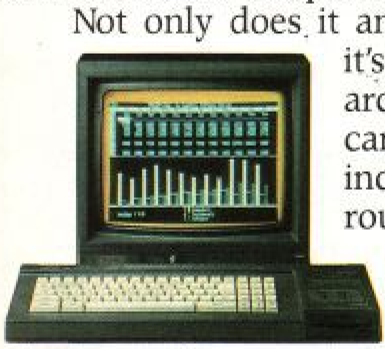
ACU

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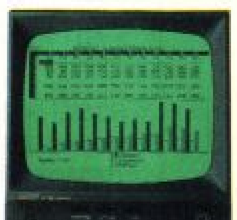
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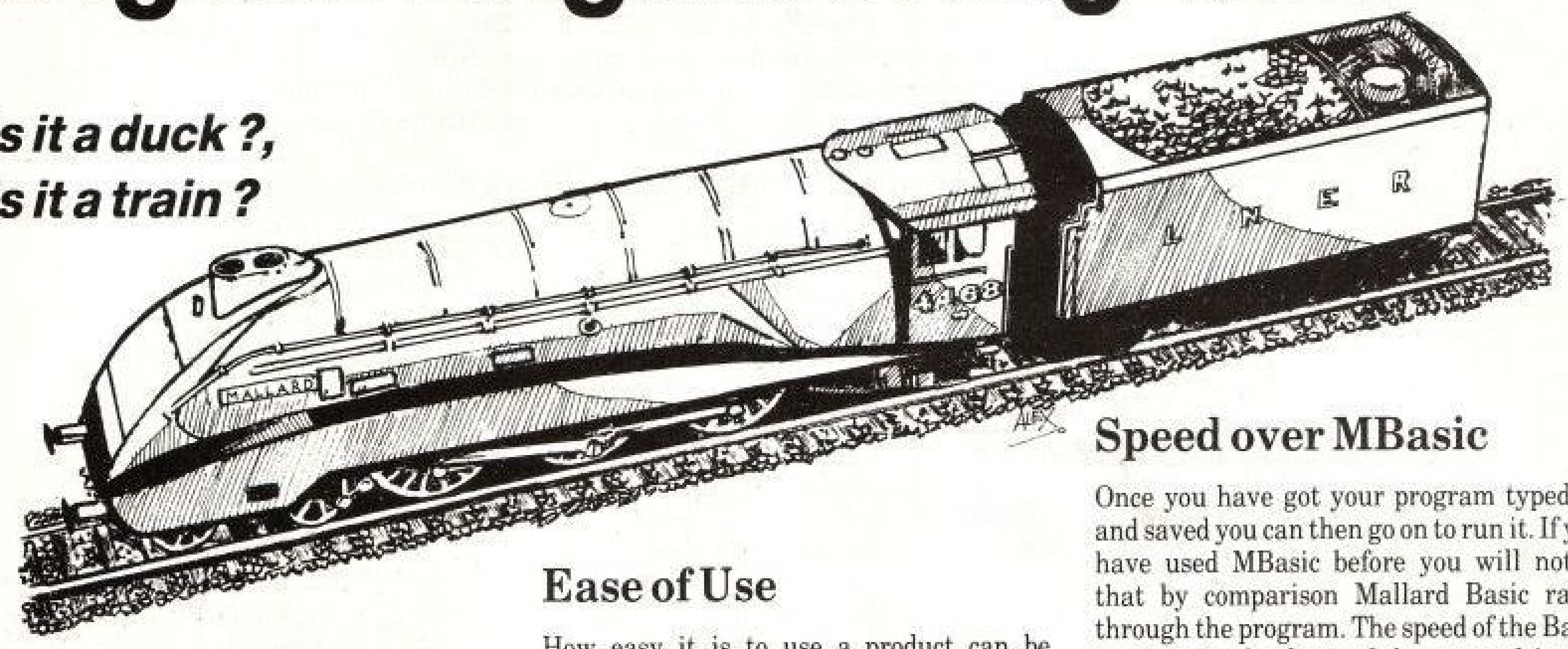
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Digital Engineering

A Review of **Mallard Basic**
By E J Brown

Is it a duck ?,
Is it a train ?



No, it's BASIC

Introduction

With the advent of the PCW8256, Amstrad is moving forward from its well established base in the home computer field to the business field. The PCW8256 comes provided with LocoScript (a dedicated word processor), CP/M + and Mallard Basic. Both LocoScript and Mallard Basic are from Locomotive software who also wrote the firmware and Basic for the CPC Series of machines. This article is not intended as a guide to programming Mallard Basic. However, a summary of the commands is provided in box 2 for the sake of completeness.

In this article we will cover the implementation of Mallard Basic on the PCW8256 and CPC6128 and highlight some of the main points of interest. 'What is Mallard Basic?', is a question that springs to mind as soon as one hears the name. In simple terms Mallard Basic is a business oriented language which for all intents and purposes is compatible with Microsoft's MBasic which is one of the 'standard' languages used on CP/M.

First Impressions

Having written many programs in MBasic, my initial impression was that Mallard Basic was just a MBasic look alike. In many respects this was found to be true but there are several significant differences, all of which helped to make a better product. These differences can be summarised in the four catagories detailed below:

* Ease of use
* Speed over MBasic
* File handling using JETSAM
* Compatability

Ease of Use

How easy it is to use a product can be measured in a number of different ways. With a program development facility like that provided by the Mallard Basic interpreter, I define ease of use as being what sort of assistance the interpreter gives you when writing programs. Ease of use is also subjective and based upon past experience. The items highlighted here are those which I found particularly useful when developing programs and which are not normally found in other similar systems.

The first thing of note is the way the interpreter changes reserved words into upper case for you. This means that by typing everything in lower case it is easy to see which are reserved words and which are variables thus making it easier to detect when you have accidentally used a reserved word as a variable.

When you do make a mistake it is easy to correct it using the EDIT command to edit a given line. By using this command the line to edit is displayed and you can move around the line using the cursor keys. Characters can be inserted and deleted at will and the edited line can either be saved or abandoned. In the latter case the original line is retained, in the former the new version is stored. While discussing the EDIT command it is worth pointing out that there is an error on page 18 of the PCW8256 manual. To abandon the edit the **STOP** key should be used as the **CAN** key does not cause the edited line to be abandoned.

Finally when you have got the program typed in and in the form you want, you can save it using the SAVE command followed by a name in quotation marks. All lower case letters in the filename will be changed to upper case thereby avoiding the problem of creating files that cannot be accessed from the CCP as is the case with some packages.

Complex file handling is also simplified by the provision of JETSAM which will be covered later.

Speed over MBasic

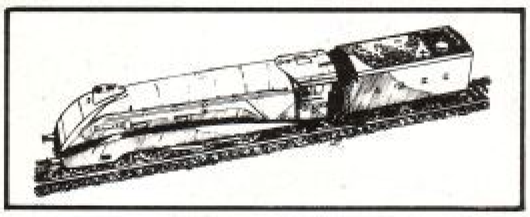
Once you have got your program typed in and saved you can then go on to run it. If you have used MBasic before you will notice that by comparison Mallard Basic races through the program. The speed of the Basic is given in the front of the manual in the form of a bit of history that is worth repeating in these days of the Inter City 125 trains:

"The world speed record for a steam locomotive is held by LNER 4-6-2 No. 4468 'Mallard', which hauled seven coaches weighing 240 tons over a measure quarter mile at 126 MPH (202KmH) on 3rd July 1938"

The timings for the benchmark programs given in box 1 are shown in table 1 for the 6128 under CP/M 2.2 and CP/M + and for the PCW8256 under CP/M +. It was not possible to provide comparisons with MBasic on these machines as I was unable to get a version of MBasic on a 3" disk for the Amstrad. However, the same benchmarks were run for both Mallard Basic and MBasic on another machine and when running under Mallard Basic the programs ran 40 to 50% faster than under MBasic. One side effect of the increased speed of execution is that programs that were written for MBasic and contained timing delays will not delay for the correct length of time.

File handling using JETSAM

File handling is greatly eased by the use of JETSAM which comes supplied with Mallard Basic. JETSAM is a B Tree file access method which greatly speeds up the accessing of files that have some method of indexing or keying associated with them. The subject of how B Trees work and how to best program their use is the topic of an article in its own right and will not be dealt with in detail here. The timings for this method of accessing records are given in table two and from these, timing the advantages of using CP/M + become more apparant. The increased speed of operation between CP/M 2.2 and CP/M + is due solely to the more advanced file handling



capabilities of CP/M +. The differences in timing between the CPC6128 running CP/M + and the PCW8256 running CP/M + are mostly due to the different implementation of the BIOS (Basic Input Output System) on the two systems. A comparison with MBasic was not possible as MBasic does not support JETSAM file access.

In addition to this, when using the RAM disk on the PCW8256 the accessing of files is even quicker and this can be used to great effect for rapid access of important data. An alternative way of using this RAM disk would be to use it as the storage area for the keys files and have the data on the physical disk. In this way, the searching for the data required would be greatly speeeded up and only the extraction of the actual data would take any noticeable time.

Compatibility

All programs written in Mallard Basic run on all versions of Amstrad machines. The only areas of a program which may need modification are the screen handling areas and modification will only be neccessary if some form of cursor addressing is used. The need for modifications in screen handling is because the control codes for screen positioning are different in CP/M 2.2 from that in CP/M +. However, if it is necessary to write a program that will run under both CP/M 2.2 and CP/M + yet still use cursor addressing, this is possible by detecting which operating system is running. A simple way of doing this is to detect how much memory is available and use this as the basis of a conditional branch. The different sizes of memory could be a problem if developed on a large memory machine as there may not be enough memory to run the program on a smaller memory machine.

Locomotive software do not claim that Mallard Basic is compatible with MBasic but I have yet to find a program written in MBasic that will not run under Mallard Basic. The internal format of MBasic and Mallard Basic is not the same so for programs to run they must have been saved from MBasic with ASCII option. There are already a number of programs such as accounts, games, and utilities which run under Mallard Basic including some that are distributed free with the Free Software Handbook.

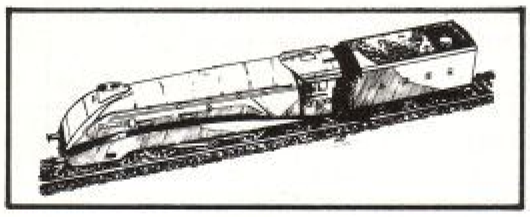
Summary

Mallard Basic is package which will allow you to run MBasic programs thus giving access to a wide range of software that is already available. Packages are already available that make use of the extended features of Mallard Basic such as JETSAM and more are being written daily. There are a considerable number of MBasic programs that will run under Mallard available free from the CP/M Users' Group (UK); and, in addition, companies such as Davis Rubin Associated and Compact are providing their software to run under Mallard Basic.

Command summary:

The following is a summary of the commands available in Mallard Basic, They are taken from the PCW8256 manual and consist of the command word followed by an explanation.

ABS	Absolute value
ADDKEY	Add a new key for an existing record
ADDREC	Add a new record and key
ASC	Get ASCII value of a character
ATN	Arc-tangent
AUTO	Automatic line numbering
BUFFERS	Set the amount of memory to be used by JETSAM
CALL	Call external subroutine
CDBL	Convert to double length
CHAIN	Chain to a new program
CHR$	Convert to character
CINT	Convert to integer
CLEAR	Clear all variables and files
CLOSE	Close a file or files
COMMON	Declare common data between programs
CONSOLIDATE	Mark Keyed file as consistent
CONT	Continue
COS	Cosine
CREATE	Create a keyed data file
CSNG	Convert value to single length
CVD	Convert string to double length numeric
CVI	Convert string to integer
CVIK	Convert key string to integer
CVS	Convert string to single length numeric
CVUK	Convert string to single length integer
DATA	Declare constant data
DEC$	Generate formatted string representation
DEF FN	Define function
DEF USR	Define external function
DEFINT	Define integer variable
DEFSNG	Define single length variable
DEFDBL	Define double length variable
DEFSTR	Define string variable
DELETE	Delete lines of program
DELKEY	Delete a JETSAM key
DIM	Dimension an array
DIR	Directory Listing
DISPLAY	Display a file on console
EDIT	Edit a program line
END	End of program
EOF	End of file
ERA	Erase a file
ERASE	Erase an array
ERL	Error line
ERR	Error number
ERROR	Generate error
EXP	Exponential
FETCHKEY$	Fetch the current key value
FETCHRANK	Fetch the current key rank
FETCHREC	Fetch the current record number
FIELD	Define a filed for a file
FILES	Display the files on the disk
FIND$	Look for a given file
FIX	Make a number to an integer
FOR	FOR loop
FRE	Free space measurement
GET	Get record from random or keyed file
GOSUB	Execute subroutine
GOTO	Go to line number
HEX$	Hexadecimal string
HIMEM	High memory point
IF	Conditional
INKEY$	Input key from keyboard
INP	Input from I/O Port
INPUT	Input data from console
INPUT#	Input data from file
INPUT$	Input fixed length string
INSTR	Search for substring in string
INT	Number to integer
KILL	Kill file
LEFT$	Extract left hand part of string
LEN	Determine length of string
LET	Preface asignment
LINE INPUT	Input complete line from console
LINE INPUT#	Input complete line for file
LIST	List file on console
LIST	List file on printer
LOAD	Load a program into memory
LOC	Current location in file
LOF	Length of file
LOG	Natural logarithm
LOG10	Log to base 10
LOWER$	Convert string to lower case
LPOS	Line printer position
LPRINT	Print line to printer
LSET	Set string left justified
MAX	Determine the maximum value
MEMORY	Reset memory parameters
MERGE	Merge two programs together
MID$	Select part of string
MIN	Determine minimum value
MKD$	Make double length string
MKI$	Make integer string



MKIK$	Make integer key string
MKS$	Make single length string
MKUK$	Make unsigned integer key string
NAME	Rename disk file
NEW	Prepare a new program
NEXT	FOR loop terminator
OCT$	Octal string
ON	On condition execute code
OPEN	Open file
OPTION	Set various options
OSERR	Return operating system error
OUT	Output to a port
PEEK	Peek a memory location
POKE	Poke a memory location
POS	Console position
PRINT	Display on screen
PRINT#	Print to file
PUT	Put data to random access file
RANDOMIZE	Randomize the random number generator
READ	Read constant data
REM	Remark
REN	Rename file
RENUM	Renumber program
RESET	Reset drives
RESTORE	Restore the constant data
RESUME	Continue after error
RETURN	Return from subroutine
RIGHT$	Extract right hand part of string
RND	Random number
ROUND	Round a number
RSET	Set string, right justified
RUN	Run a program
SAVE	Save a program
SEEKKEY	Seek to given key
SEEKNEXT	Seek to next key
SEEKPREV	Seek the previous key
SEEKRANK	Seek to the given rank
SEEKREC	Seek to the given record
SEEKSET	Seek to next different key
SGN	Sign of value
SIN	Sine
SPACE$	String of spaces
SPC	Print a given number of spaces
SQR	Square root
STOP	Stop execution
STR$	String representation of numeric
STRING$	String of particular character
STRIP$	Make character 7 bit
SWAP	Swap the contents of two variables
SYSTEM	Return to CP/M
TAB	Tab forward
TAN	Tangent
TRON	Trace on
TROFF	Trace off
TYPE	Type file to console
UPPER$	Convert string to upper case
UNT	Convert usigned integer
USR	Invoke external user function
VAL	Convert string to numeric value
VARPTR	Get pointer to variable
VERSION	Determine which version of Basic is in use
WAIT	Wait on I/O port
WEND	End of while loop
WHILE	While loop
WIDTH	Set width of console
WIDTH PRINT	Set width of printer
WRITE	Write to console
WRITE#	Write to file
ZONE	Set print zone size

Table 1:

Free bytes available after loading Basic.

CP/M 2.2			CP/M +	
CPC464	CPC664	CPC6128	CPC6128	PCW8256
9325	9325	9325	31597	31597

Jetsam record access timings, all values given are in minutes and seconds.

	CP/M 2.2	CP/M +		
Records	CPC6128	CPC6128	PCW8256	PCW8256 (RAM disc)
200	18:32	5:07	3:47	3:00
400	55:17	10:45	9:11	6:20

```
5   PRINT CHR$(7);
10  DEFINT A-Z
20  NUMFILES=2
30  IF NUMFILES=0 THEN NUMFILES=1 : PRIN
   T NUMFILES ELSE PRINT
40  RL=128
50  IF RL<2 THEN RL=2:PRINT RL ELSE PRIN
   T
60  NUMKEY=200
70  IF NUMKEY=0 THEN NUMKEY=5:PRINT NUMK
   EY ELSE PRINT
80  NUMBUFF=1
90  IF NUMBUFF=0 THEN NUMBUFF=6:PRINT NU
   MBUFF ELSE PRINT
100 SEED!=1
110 ULOCK=0
120 RLOCK=1
130 WLOCK=2
140 MEMORY,,NUMFILES,RL
150 BUFFERS NUMBUFF,5
160 DIM FREC$(NUMFILES),JET$(NUMFILES)
170 ON ERROR GOTO 250
180 FOR FILE=1 TO NUMFILES
190 GOSUB 820
200 KILL RECNAME$
210 KILL KEYNAME$
220 NEXT FILE
230 RESET
240 GOTO 260
250 RESUME 260
260 ON ERROR GOTO 0
270 FOR FILE=1 TO NUMFILES
280 GOSUB 820
290 CREATE FILE,RECAME$,KEYNAM$,ULOCK,RL
    ,"DEWDEWFLOP"
300 FIELD FILE,RL-2 AS FREC$(FILE)
310 NEXT FILE
320 PRINT "ADDING"
330 RANDOMIZE SEED!
340 FOR I=1 TO NUMKEY
350 GOSUB 700
360 LSET FREC$(FILE)=RECORD$
370 JRC=ADDREC(FILE,ULOCK,RANK,KEY$)
380 IF JRC=131 THEN GOTO 370
390 IF JRC<>0 THEN PRINT "add fail":STOP
400 PRINT FILE,FETCHRANK(FILE),FETCHKEY$
    (FILE)
410 NEXT I
420 PRINT "SEEKING"
430 RANDOMIZE SEED!
440 FOR I=1 TO NUMKEY
450 GOSUB 700
460 JRC=SEEKKEY(FILE,WLOCK,RANK,KEY$)
470 IF JRC>=130 THEN GOTO 460
480 IF JRC<>0 THEN PRINT "seekkey fail":
    STOP
490 PRINT FILE,FETCHRANK(FILE),FETCHKEY$
    (FILE)
500 GET FILE
510 OLDREC=FETCHREC(FILE)
520 IF FREC$(FILE)<>RECORD$THEN PRINT"RE
    CORD FAIL":STOP
530 PRINT RECORD$
540 JRC=DELKEY (FILE,UNLOCK)
550 IF JRC - 131 THEN GOTO 540
560 IF JRC=105 THEN PRINT "delkey fail":
    STOP
570 JRC=LOCK(FILE,UNLOCK,OLDREC):IF JRC<
    >0 THEN PRINT "UNLOCK FAIL",JRC:STOP
580 NEXT I
590 GOSUB 640
600 FOR FILE=1 TO NUMFILES
610 CLOSE FILE
620 NEXT FILE
625 PRINT CHR$(7);
630 END
640 REM ROUTINE SEEKING
650 FOR FILE=1 TO NUMFILES
660 PRINT"SEEKING FILE";FILE
670 IF SEEKRANK(FILE,UNLOCK,0)<>103 THEN
     PRINT"FILE NOT EMPTY":STOP
680 NEXT FILE
690 RETURN
700 REM ROUTINE CREATE A RANDOM KEY
710 KL=INT(RND*32)
720 KEY$=""
730 FOR J=1 TO KL
740 KEY$=KEY$+CHR$(INT(RND*26)+ASC("A")
750 NEXT J
760 FILE=INT(RND*NUMFILES)+1
770 RANK=INT(RND*8)
780 RECORD$=STR$(FILE)+STR$(RANK)+KEY$
790 RECORD$=RECORD$+SPACE$(MAX(0,RL-2-LE
    N(RECORD$)))
800 RECORD$=MID$(RECORD$,1,RL-2)
810 RETURN
820 REM ROUTINE CREATE THE FILE NAMES
830 RECNAME$="REC,"+STR$(FILE)
840 KEYNAME$="KEY,"+STR$(FILE)
850 RETURN
'
```

ACU

Winning Way with Words

The new Protext wordprocessor from Arnor has found favour with everyone in the Amstrad User Office. Many of our articles are now written using Protext. Arnor have offered us the chance to make FIVE Amstrad Users very happy. The Protext Rom usually costs around £45 including the AD1 Rom board. You can win one by entering this simple competition.

How To Win

Word Processors are a very personal thing, it is very difficult to write one which does everything the user wants. Protext has most the the frequently used features. Which of these do you think are the three most important.

a. Plenty of room for long documents
b. Fast movement within a document
c. Instant ROM loading
d. Word count
e. Language options

Rules

1. The winners will be the first five entries which most closely correspond to the answers that the judges consider to be most appropriate.

2. Entries must reach the Amstrad User office by 27th December (remember the Post takes longer at Christmas).

3. Only one entry per person. You may photocopy the form. Anyone submitting more than one form will have all entries disqualified.

4. No correspondence can be entered into regarding the competition. Entries cannot be returned.

5. The judges' decision is final.

6. No employees of Amstrad, Amsoft or Amstrad User, nor their relatives may enter.

7. Entries should be sent to: Arnor Protext Competition, Amstrad User, 169 Kings Road, Brentwood, Essex, CM14 4EF

ENTRY FORM

NAME.................................. ***1** st* ☐

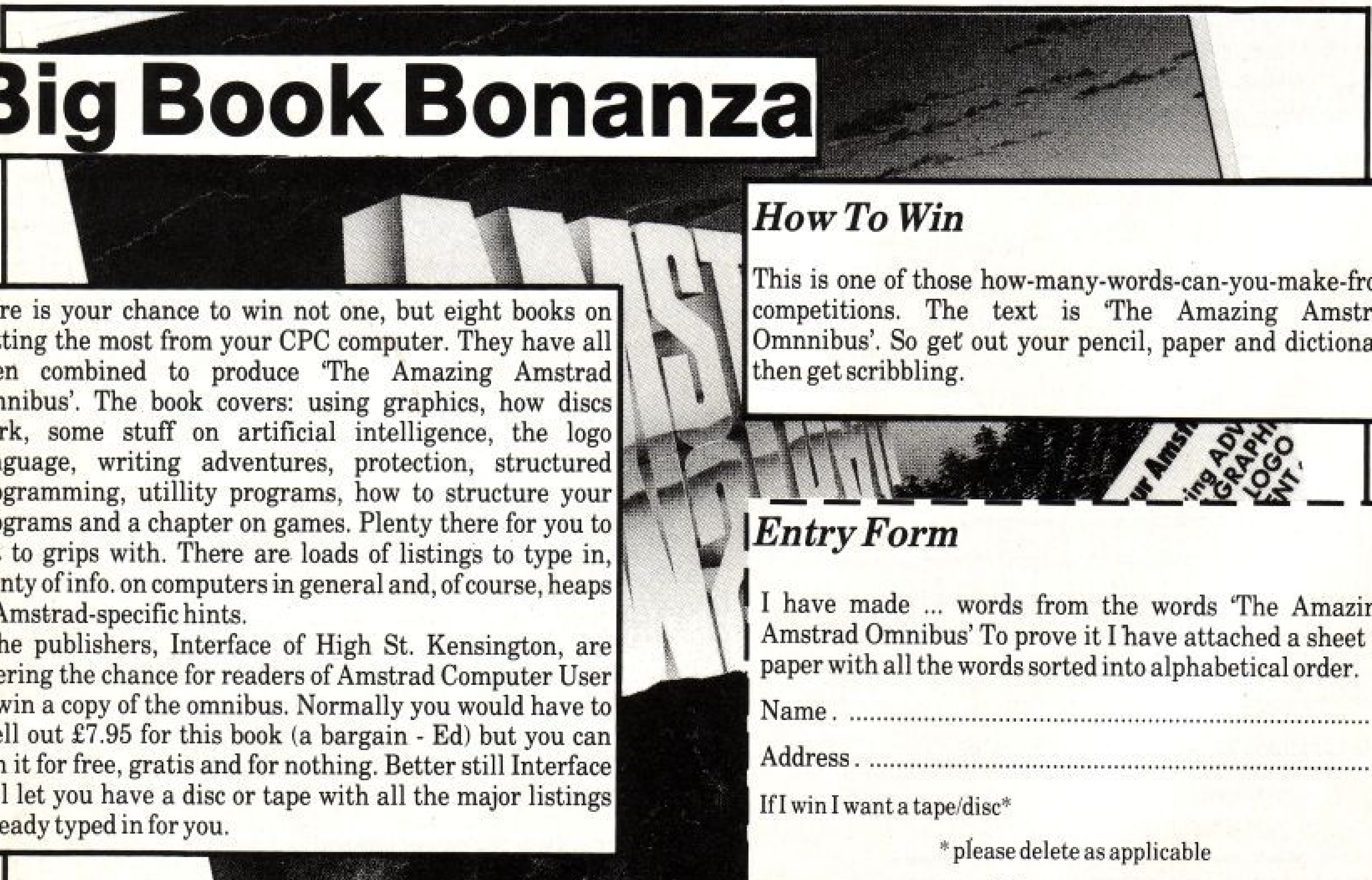
ADDRESS............................ ***2** nd* ☐

....

POSTCODE.......................... ***3** rd* ☐

INSERT LETTER IN BOX PROVIDED

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Here is your chance to win not one, but eight books on getting the most from your CPC computer. They have all been combined to produce 'The Amazing Amstrad Omnibus'. The book covers: using graphics, how discs work, some stuff on artificial intelligence, the logo language, writing adventures, protection, structured programming, utillity programs, how to structure your programs and a chapter on games. Plenty there for you to get to grips with. There are loads of listings to type in, plenty of info. on computers in general and, of course, heaps of Amstrad-specific hints.

The publishers, Interface of High St. Kensington, are offering the chance for readers of Amstrad Computer User to win a copy of the omnibus. Normally you would have to shell out £7.95 for this book (a bargain - Ed) but you can win it for free, gratis and for nothing. Better still Interface will let you have a disc or tape with all the major listings already typed in for you.

How To Win

This is one of those how-many-words-can-you-make-from competitions. The text is 'The Amazing Amstrad Omnibus'. So get out your pencil, paper and dictionary then get scribbling.

Entry Form

I have made ... words from the words 'The Amazing Amstrad Omnibus' To prove it I have attached a sheet of paper with all the words sorted into alphabetical order.

Name. ....

Address. ....

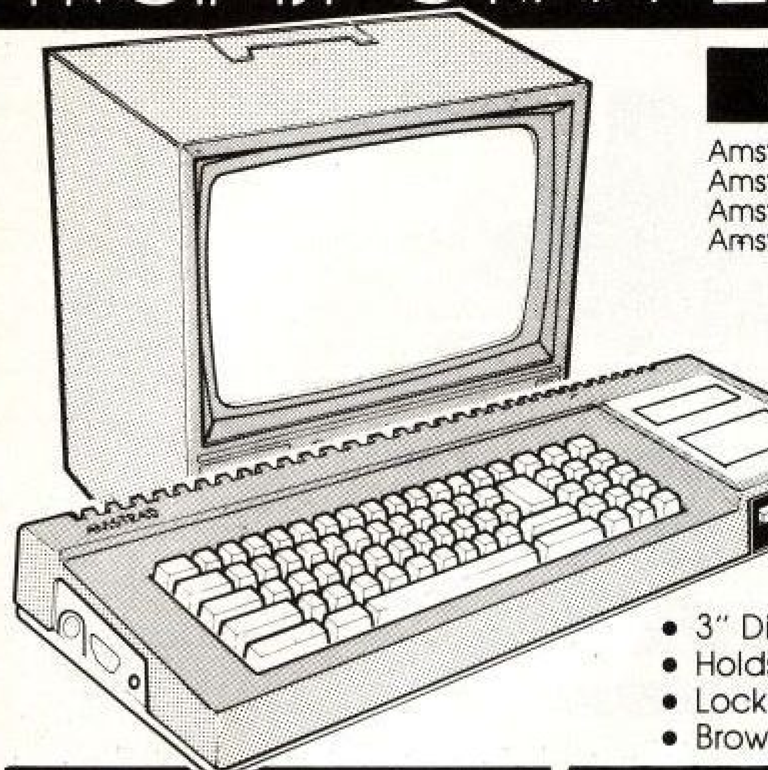
If I win I want a tape/disc*

* please delete as applicable

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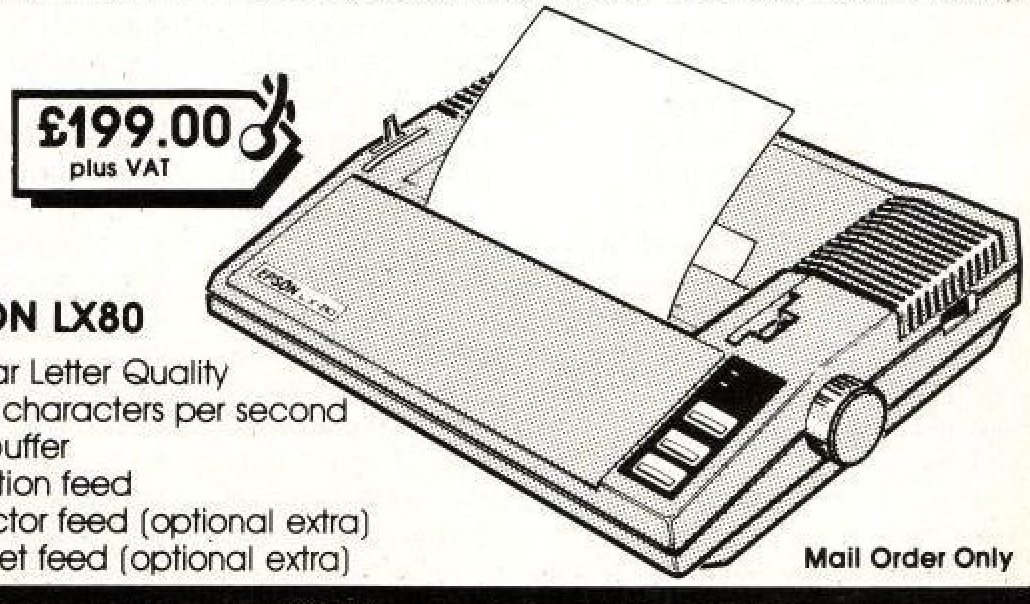
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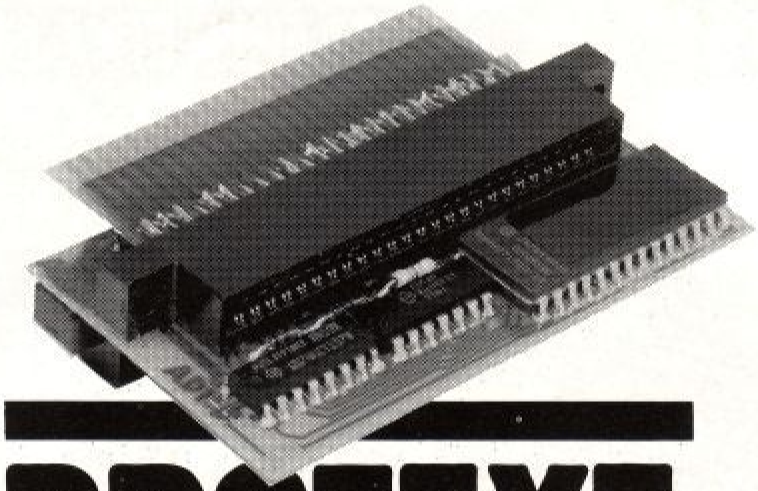
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PROTEXT

This is the latest offering from the Arnor bedroom, sorry, workshop, and is every bit as good as their last offering: Maxam.

When reviewing a word processing package it is customary to produce the article with it. This article has been written mostly with Protext, and a little bit with a portable computer. The text from that was merged into the article using the Protext ROM.

Disc and tape versions are available (for all the Arnold series) which differ only in that they use up your computer's memory and so leave you with less space for text. With the ROM version installed piggyback on a Maxam AD1 with a Honeysoft ROM board and a disc drive fitted, there is room for about 39,000 characters (This article is about 10,000 characters). Comparing this with a 10,000 character maximum in Amsword and 22,000 with Tasword-D, you will appreciate the advantage of having the software in ROM. For people who are counting, Protext uses 516 bytes of user RAM.

At £50 for the complete plug-in ROM board and £40 for the ROM on it's own, the price compares favourably with the other 'large capacity' word processors such as Newword (a Wordstar clone) and Microscript. It is miles ahead of the cheaper Amsword-type programs.

Microscript has a capacity limited only by the disc size but is only recommended for use on two drive systems. With Protext, all the text is in the memory. This restricts the size of the document but eliminates time consuming disc accesses while editing. Getting to the end of even a large document takes no longer than a second or so. The speed of initially loading a file from the disc into memory has been reduced drastically, I understand that this was due to a misunderstanding with the way text files are handled by the Arnold. Maxam got round this by loading the files in a character at a time, but Protext loads them in directly, disc block at a time, which is much faster.

After you have entered Protext (by typing '|P'), the ROM starts you off in command mode. From there you can read directories, load printer drivers and read in text. At this point, typing 'HELP' gives a list of available commands, together with their one or two character shorthand versions. Hitting <ESC>, or using a command such as 'Format' flips you into the full screen editor. If you run really short of space, you can turn off the ruler line at the top of the screen and the help menu lives at the bottom.

It is possible to hop out into Basic or Maxam without losing all your text.

When you have loaded a document, moving around in it is simple. You can move by characters, words, lines, paragraphs, pages or straight to the top and bottom with fairly easy to remember keystrokes. The old insert and overstrike modes are there too. As with the Maxam and Locomotive Basic editor, they are toggled with the [CTRL] and [TAB] keys.

As well as the usual word and line deletion, text can be manipulated and saved as blocks (markers in use are shown on the status line). Just about anything that can be done with the text can be done to a block on its own; saving, loading (merge), formatting, word count as well as moving, deleting and copying.

The 'Find and Replace' commands are very powerful. For a start, they can have true 'wild cards' in them as well as the usual whole word and upper/lower case options. If you did not ask for a global search, a repeat of the last find or replace is possible using the copy key.

The program uses hard and soft spaces, returns and hyphens. These are the clever bits that allow a word processor to know how to group and split text into lines and paragraphs. Roughly speaking, the hard ones are the ones you type and the soft ones are the ones the word processor puts in (and takes out) itself. There are also non-break spaces which are used to glue two words together so they will not be reformatted or split. The soft hyphen is especially useful when using very long words. Out of the scope of your average ACU journalist, but frequently needed by, say, Germans. To assist our foreign friends, there are character set options for both display and printing. If you own an Epson or Epson clone like the DMP 2000, you can rip into the fancy printing lark with all the bold, underscore, super and subscript codes, and so on, as they are already defined in the printer ROM.

People with other printers can redefine the printer code

tables and file them on tape or disc for use with all their documents. Not even the ubiquitous Wordstar does this (unless you run umpteen different versions).

The printer set up also allows any ASCII code to be redefined as a string of other ASCII characters. This would be useful for shifting into a graphics mode on your printer to do a peseta symbol instead of a pound or dollar.

There is a whole host of commands that can be left on a command line (these are lines that start with a '›'). Apart from the usual rulers, more than one per document is permitted, headers and footers. You can do more complex things like run RSX commands while printing the document and merge in other files. All the usual page numbering, top, bottom, left and right margins, left and right paging is in there. For those of you who want it all on one long bit of paper, a line length of one does the trick.

The status line at the top of the screen shows all the useful information: page and line number, caps and shift lock status, insert/overwrite, room left, word wrap and justify toggles, though these are truncated in 40 column mode (useful if you are using Grannies cranky old TV set and an MP-1).

list of commands available in command mode:

CAT	Same as disc or tape catalog
CLEAR	Clear PROTEXT workspace
COUNT	Count words in document
COUNTB	Count words in block only
DANISH	Switch to Danish character sets
DOC	Work in document mode
ENGLISH	Switch to English character sets
FIND	Find a string in the text
FORMAT	Format all the text
FORMATB	Format the block only
FRENCH	Switch to French character sets
GERMAN	Switch to German character sets
HELP	Displays a list of commands
ITALIAN	Switch to Italian character sets
LOAD	Load a new text file
LOADB	Load a block in at cursor position
MERGE	Same as above
MODE	Switch modes between 80 and 40 column
MODIFY	Add/delete line numbers and quotes to text
PRINT	Print out text (what else?)
PRINTB	Print out block
PRINTF	Spool text to a file
PRINTFB	Spool block to a file
PRINTS	Print text to Screen for checking
PRINTSB	Print block only to screen
PRINTER	Loads printer driver file
PROG	Work in program (ASCII file) mode
QUIT	Return to BASIC
REPLACE	Find and replace strings
SAVE	Save text
SAVEB	Save block only
SETPRINT	Saves current printer driver
SPEED	Alter cassette write speed
SPANISH	Switch to Spanish character sets
SWEDISH	Switch to swedish character sets
VERSION	Return version number of PROTEXT

Returning to command mode creates a split screen. The bottom six lines become a command window. For reading directories of incredibly overworked discs or esoteric ROM routines, the CLR key clears the working text from the screen and gives you the whole thing for your directory or whatever.

The original manual was printed on a Taxan printer and written using Protext. The final version of the manual will be virtually identical, but all properly typeset on glossy paper etc. and bound with something more substantial than staples.

The version I was given explained in words of very few syllables how to get the thing up and running from scratch. If, by some remote chance, there is something that you do not understand, Arnor have put their address and phone number in the manual and are very helpful blokes. This should not be necessary though as there is a perfectly usable index and command summary at the back of the manual.

If any of the technical words are too deep for you, there is a glossary in the back of the manual.

Place markers can be inserted into the text, and the ones currently in use are shown on the status line. The same commands that move the cursor to the markers will also move it to the left or right margins.

As more and more users of Amstrad computers are buying disc drives, the Protext ROM now redefines the <CTRL> <ENTER> combination to produce RUN"DISC instead of just RUN", which tends to cause an error with discs attached. This can be used to set up your own initialisation programs on the discs that set up ink colours and printer drivers as well as for the idle beggar's method of running games discs.

File handling is a doddle. Once you have loaded in a file, all subsequent saves are done using that filename by default. Unlike the old Maxam, pointers and block markers are not lost when saving. This makes regular backups easy and so prevents much of the cursing and swearing when the power is cut off after the mains plug has been used as a footrest.

The general screen update speed is incredibly fast. Much faster than is normally possible using the Amstrad firmware. It updates the entire screen in about a quarter of a second

Arnor have introduced a new file type to the Amstrad collection : document. This is a non-ASCII file and cannot be loaded into the likes of Tasword, Maxam or Basic programs using INPUT#9. Protext does produce straight ASCII files if you specifically ask it to though, and it is possible to load a document file, change to ASCII (they call it program) mode and save the file again. The rulers and control codes used by the word processing bit still stay in but the text is intact.

The program mode is there so that Arnor can produce a 'Super-Maxam' which has the space normally taken up by the editor filled with decent single stepping routines, macros and so on.

Other planned add-ons include a spelling checker and mailmerge facility in the fairly near future. Arnor have left all the necessary software patches in the existing code so the new programs can be easily integrated.

This program is well written, well thought out and not too expensive. They took their time with it and it was worth the wait. For those people who bought a 6128 in preference to a Joyce, this comes a close second.

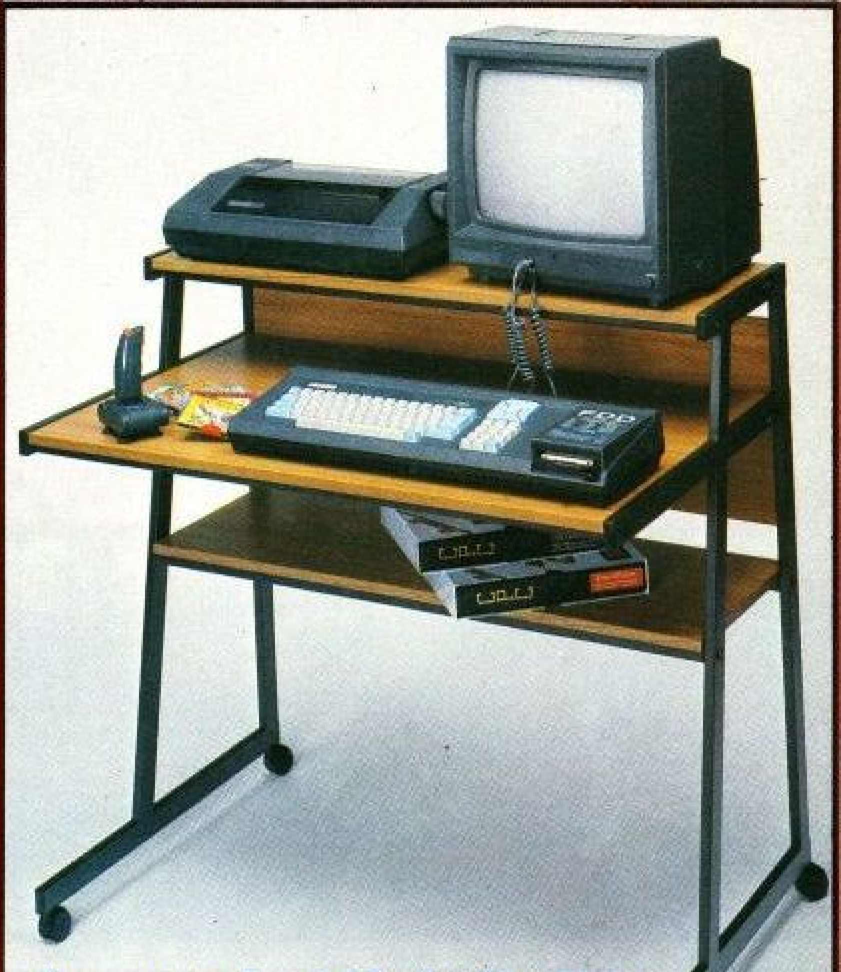
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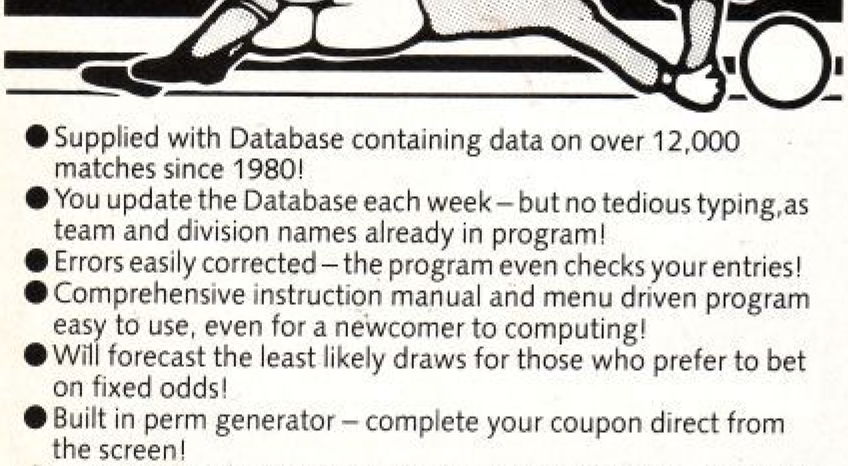
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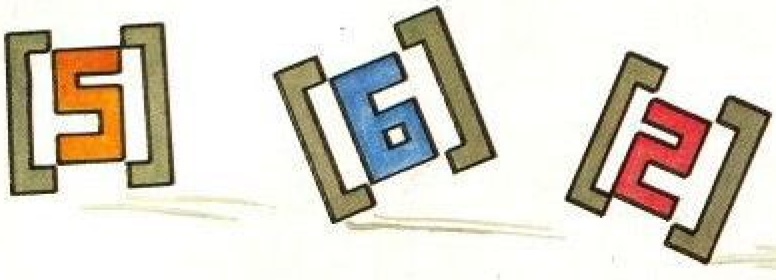
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KEEP TRON TRUCKING

By Chris Wood





You know how it is: you have just spent three days typing in that listing from a magazine, or three weeks composing that 30K masterpiece, and when you finally run the whole thing it starts printing gibberish on the screen, and not playing that Submarine Flight Simulator like it should.

Well, now is the time to use the Amstrad's Trace function, to print out the line numbers as the program is executing them, and if you didn't know that it had one - read your manual. It's amazing how many people don't, you know. Anyway, to get back to the point, the trace function is turned on with the command TRON (TRace ON, and wasn't it a great film?) and off with -obviously enough - TROFF. With TRON running the screen looks even worse. It just prints the line number at the next available cursor position, and so the screen rapidly becomes full of numbers, which is not as useful as it could be.

Fear not; with this program the line numbers are directed to Channel 7 and the program will chug along as it would normally. Also, to give you more of a chance to see which are the offending lines, you have a variable speed control with 255 speeds (and normal speed) to choose from. And as if that isn't enough, so as to leave the display completely intact, you can have all the TRON output sent to your printer if you have one connected.

Type in the program and run it. You do not need to save it first as it cannot do anything until you page it in. If you get any of the data wrong then the program will tell you which line needs attention. If all is well it will have moved HIMEM down by 208 bytes and put itself above it out of the way. It doesn't matter where you have HIMEM as the POKES in the program will tell it where it is. So, if you find that it conflicts with any of your programs that use that area, then lower HIMEM before running it for the FIRST time. When it has run once it will not lower HIMEM again - if you have to make corrections to the DATA for example.

When you have a proper working copy then you can save it. To see it in action you need to page it in. As all that is neccesary to do this is three POKES, I didn't see the point for a special RSX, but what the program does do is put a command string in the ZERO key on the numeric key pad to do the POKES, and one in the POINT key on the pad to turn it off. Hit ZERO, press ENTER to send the command and you should see....nothing at all. This is because you aren't running a program.

Type NEW and ENTER then type in this little program as shown.

```
10 FOR n=32 TO 255
15 REM
20 PRINT CHR$(n);
25 REM
30 NEXT n
```

The REMs are just so you can see more numbers when it runs. Set up a suitable window for the TRON numbers to go into, such as:

```
WINDOW #7,1,40,25,25
```

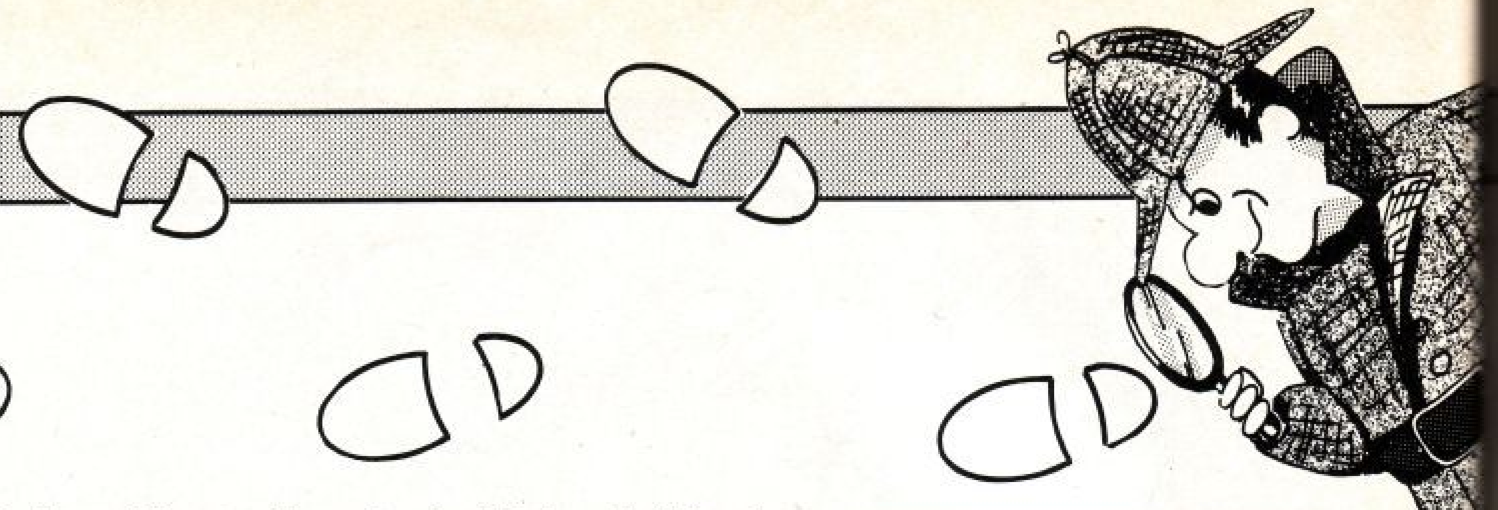
which is the bottom line of the screen in Mode one, and type in:

```
TRON:CLS:RUN
```

Do not type 'MODE 1' to clear the screen or this will reset the window for channel 7. It is not a good idea to try this on the actual program you have just saved because it will crash as it tries to change itself while it is running.

What you should see is the character set being printed out as normal at the top of the screen and the line numbers being printed on the bottom of the screen. To see the difference, press ESC ESC, page out the routine by pressing the POINT key on the pad and ENTER, and run the program again. Press ESC ESC and page it back in for the next bit. This is all very useful but the numbers go a bit quickly and so now you can try out the speed control. Simply POKE 2 with a number between 0 and 255: 0 is normal and 255 is very slow. Try 20 and you will notice that the 'Ready' message is printed slower than normal. This is because the routine slows down all the printing on the screen, except what you type in from the keyboard and during editing, as the interpreter uses a lower level of indirection for those tasks. Your program will list slower too. Now run it and if you still think it's too fast then slow it down some more.

If you don't want the TRON numbers to appear on the screen at all, whether it s because you have a very full screen - and remember you can put Channel 7 anywhere on the screen - or you are using all the windows already, you can send all the numbers to the printer. You do this by POKE 3,0. Any other number will send them to the screen. If you don't have a printer and you have a very full screen, the problem with making a very small window for the numbers is that if they are not all the same size, parts of them appear on different



lines and they are very hard to read. To get around this POKE 4,0 then carriage return and a line feed is printed after each number, so they all start printing on the left of the window. Define your window three characters wider than the number of digits in your highest line number and two high, e.g. if your highest number is 12000 use:

```
WINDOW #7,1,8,24,25
```

or similar. This is one for the brackets either side and a SPACE to stop the window scrolling when the cursor reaches the right hand side. Any other number POKEd into location 4 will turn off this feature. I don't suggest you use it with the numbers going to the printer or you will use a of a lot of paper.

Now, this is an overview of the routine and some of its limitations. Firstly, when the PRINT indirection is directed to it, it prints as normal until it meets the '[' character which is printed before each line number when TRON is working. It then sets a flag, but does not print the character. It waits until the next character and if it is a number it prints both the '[' character and the number to channel 7 or the printer depending on which you have selected, and sets a flag to say 'output to channel 7 from now on'. However, if the character following the '[' was not a number it prints them both to the normal screen, and resets the 'output to 7' flag. This has minor limitations. If you really want to print a '[' and a digit on the normal screen then it will go to channel 7, but who uses '[' in BASIC? There is one other check on the characters. If you print the '[' character on the screen and then the routine wants to print the line number it would revert control to the screen when it came across a second '[' at the start of the number. For this case when '[' is followed by '[' one goes to the screen, one to channel 7 and the 'output to 7' flag is left on. This means that for every '[' followed by '[' on the screen an extra one goes to channel 7 (or the printer) for good luck. This is not really a problem as at least the normal display gets the correct characters. This also means that if you print multiple '['s, then they will be echoed in channel 7 even when TRON is TROFFed. If you *really* want to do this then page out the routine as you are not using it anyway.

When the 'output to 7' flag is set all the output is of course sent to channel 7 until the ']' character is found; where upon it is reset to the screen, after checking whether a carriage return and line feed need to be sent after printing the ']' character. Altogether, this routine should help make debugging large programs less of a nightmare. This means that any text you want to send to the printer can be prefixed by a [1. Then] to stop output to the printer. This is ideal for printing a catalogue.

```
10 'Redirected ITRON'" output routine.
20 'Chris Wood. 24/9/85.
30 '
40 h=HIMEM-1:IF PEEK(0)=0 THEN GOTO 60
50 POKE 0,0:h=h-208:MEMORY (h-1)
60 lin=1000:add=h:FOR t=1 TO 208 STEP 8
70 chk=0:FOR b=0 TO 7
80 READ a$:a$=UPPER$(a$):n=1
90 IF LEN(a$)<>2 THEN GOTO 340
100 b$=MID$(a$,n,1)
110 GOSUB 320:IF a=0 THEN GOTO 340
120 n=n+1:IF n=2 THEN GOTO 110
130 p=VAL("&"+a$):POKE add,p
140 add=add+1:chk=chk+p
150 NEXT b: READ a
160 IF a<>chk THEN GOTO 340
170 PRINT "Line";lin;"OK":lin=lin+10
180 NEXT t
190 r=h+39:a=INT(r/256):b=r-(a*256)
200 POKE h+18,b:POKE h+19,a
210 POKE h+118,b:POKE h+119,a
220 POKE h+154,b:POKE h+155,a
230 POKE h+180,b:POKE h+181,a
240 POKE h+198,b:POKE h+199,a
250 POKE h+45,PEEK(&BB5B)
260 POKE h+46,PEEK(&BB5C)
270 a=INT(h/256):b=h-(a*256)
280 POKE h+77,b:POKE h+78,a
290 KEY 128,"poke &bb5a,195:poke &bb5b,"
  +STR$(b)+":poke &bb5c,"+STR$(a)
300 KEY 138,"poke &bb5a,207:poke &bb5b,"
  +STR$(PEEK(h+45))+":poke &bb5c,"+STR
  $(PEEK(h+46))
310 POKE 0,0:POKE 1,0:POKE 2,0:END
320 a=INSTR("0123456789ABCDEF",b$)
330 RETURN
340 PRINT"ERROR in line";lin:END
1000 DATA E5,D5,C5,F5,47,3A,00,00, 1013
1010 DATA A7,20,52,5F,78,FE,5B,28, 881
1020 DATA 42,CD,47,4E,2A,01,00,7C, 587
1030 DATA A7,28,07,2E,00,2B,7C,B5, 608
1040 DATA 20,FB,F1,C1,D1,E1,C9,3E, 1414
1050 DATA CF,32,5A,BB,21,00,94,22, 749
1060 DATA 5B,BB,7B,FE,07,78,28,05, 827
1070 DATA CD,5A,BB,18,0A,3A,03,00, 577
1080 DATA A7,78,20,F4,CD,2B,BD,3E, 1062
1090 DATA C3,32,5A,BB,21,20,4E,22, 699
1100 DATA 5B,BB,C9,3E,01,32,01,00, 593
1110 DATA 32,00,00,18,B7,3A,01,00, 316
1120 DATA A7,20,1B,78,FE,5D,20,06, 731
1130 DATA AF,32,00,00,18,4A,3E,07, 392
1140 DATA 5F,CD,B4,BB,4F,CD,47,4E, 1100
1150 DATA 79,CD,B4,BB,18,96,AF,32, 1092
1160 DATA 01,00,78,FE,5B,28,29,FE, 801
1170 DATA 30,38,15,FE,3A,30,11,3E, 564
1180 DATA 07,5F,CD,B4,BB,4F,C5,06, 956
1190 DATA 5B,CD,47,4E,C1,79,18,D5, 996
1200 DATA AF,32,00,00,3E,01,CD,B4, 673
1210 DATA BB,4F,5F,CD,B4,BB,18,E6, 1187
1220 DATA 32,01,00,CD,47,4E,18,B6, 611
1230 DATA 3A,04,00,A7,20,B0,3E,07, 506
1240 DATA 5F,CD,B4,BB,4F,CD,47,4E, 1100
1250 DATA 06,0D,C5,06,0A,18,CA,00, 458
```

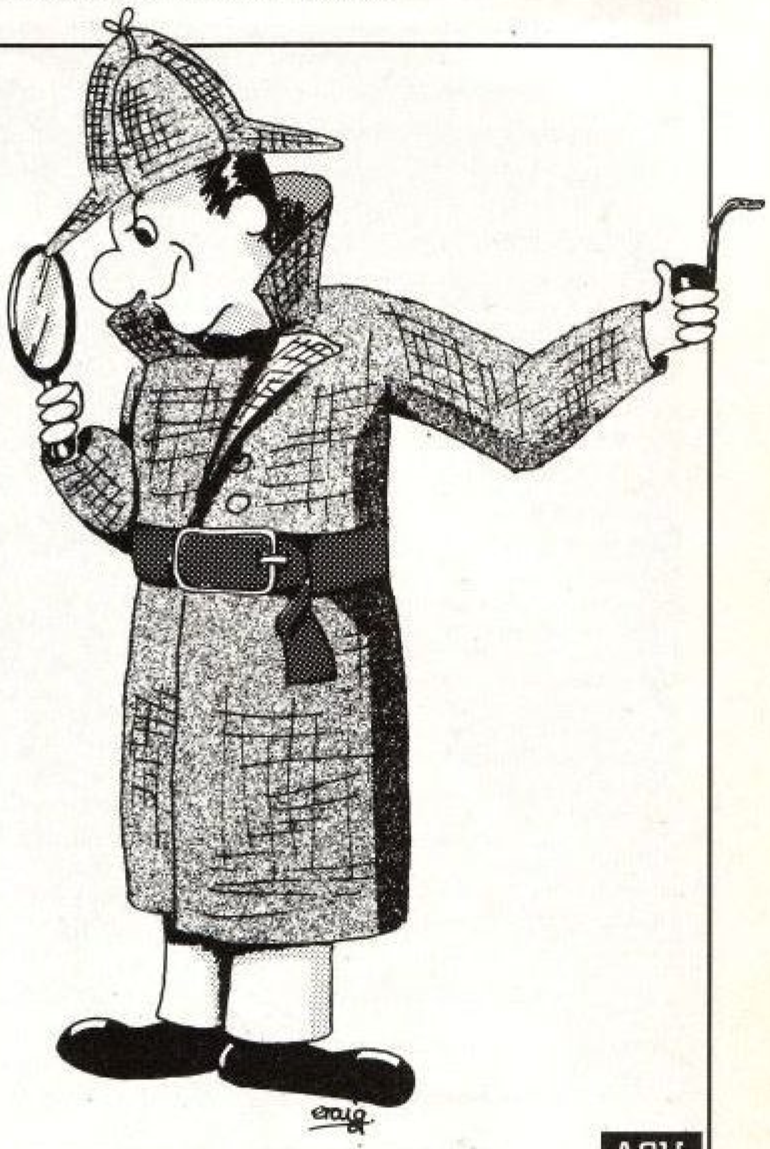
Machine Code Source

```
;ROUTINE TO DIRECT THE ITRON' FUNCTION
;OUTPUT TO EITHER CHANNEL 7 OR TO THE
;PRINTER, WITH A VARIABLE SPEED
;CONTROL.

    ;POKE 3,0 TO SEND TO PRINTER
    ;ANYTHING ELSE FOR SCREEN.
    ;POKE 2,0 TO 255 FOR SPEED.
    ;RANGE 1 TO 50 IS MOST USEFUL.
    ;0 FOR NORMAL SPEED.
    ;POKE 4,0 TO SEND A CARRIAGE RETURN
    ;AND A LINE FEED AFTER EACH NUMBER.

    TXTSTR:   EQU#BBB4
    SC_JMP:   EQU#BB5A
    PR_JMP:   EQU#BD2B
    FLAG1:    EQU0
    FLAG2:    EQU1
    SPEED:    EQU2
    PR_ON:    EQU3
    FLAG3:    EQU4
              ORG20000
              PUSHHL
              PUSHDE
              PUSHBC
              PUSHAF
              LDB,A
              LDA,(FLAG1)
              ANDA
              JRNZ,CHANGE
              LDE,A
              LDA,B
              CP"["
              JRZ,SETUP
              CALLPRINT
    BACK:     LDHL,(SPEED-1)
              LDA,H
              ANDA
              JRZ,NORMAL
              LDL,0
    DELAY:    DECHL
              LDA,H
              ORL
              JRNZ,DELAY
    NORMAL:   POPAF
              POPBC
              POPDE
              POPHL
              RET
    PRINT:    LDA,207
              LD(SC_JMP),A
              LDHL,37888
              LD(SC_JMP+1),HL
              LDA,E
              CP7
              LDA,B
              JRZ,OUTP
    SCRN:     CALLSC_JMP
              JRSCRN2
              OUTP:LDA,(PR_ON)
              ANDA
              LDA,B
              JRNZ,SCRN
    CALL  PR_JMP
    SCRN2:    LDA,195
              LD(SC_JMP),A
              LDHL,20000
              LD(SC_JMP+1),HL
```

```
          RET
SETUP:    LDA,1
          LD(FLAG2),A
          LD(FLAG1),A
          JRBACK
CHANGE:   LDA,(FLAG2)
          ANDA
          JRNZ,CHECK
          LDA,B
          CP"]"
          JRNZ,SKIP
          XORA
          LD(FLAG1),A
          JRRESET3
SKIP:     LDA,7
          LDE,A
SKIP2:    CALLTXTSTR
          LDC,A
SKIP3:    CALLPRINT
          LDA,C
          CALLTXTSTR
          JRBACK
CHECK:    XORA
          LD(FLAG2),A
          LDA,B
          CP"["
          JRZ,RESET2
          CP"0"
          JRC,RESET
          CP":"
          JRNC,RESET
          LDA,7
          LDE,A
          CALLTXTSTR
CHK1:     LDC,A
CHK2:     PUSHBC
          LDB,"["
CHK3:     CALLPRINT
          POPBC
          LDA,C
          JRSKIP3
RESET:    XORA
          LD(FLAG1),A
          LDA,1
          CALLTXTSTR
          LDC,A
          LDE,A
          CALLTXTSTR
          JRCHK2
RESET2:   LD(FLAG2),A
          CALLPRINT
          JRSKIP
RESET3:   LDA,(FLAG3)
          ANDA
          JRNZ,SKIP
          LDA,7
          LDE,A
          CALLTXTSTR
          LDC,A
          CALLPRINT
          LDB,13
          PUSHBC
          LDB,10
          RCHK3
          ENT$
```



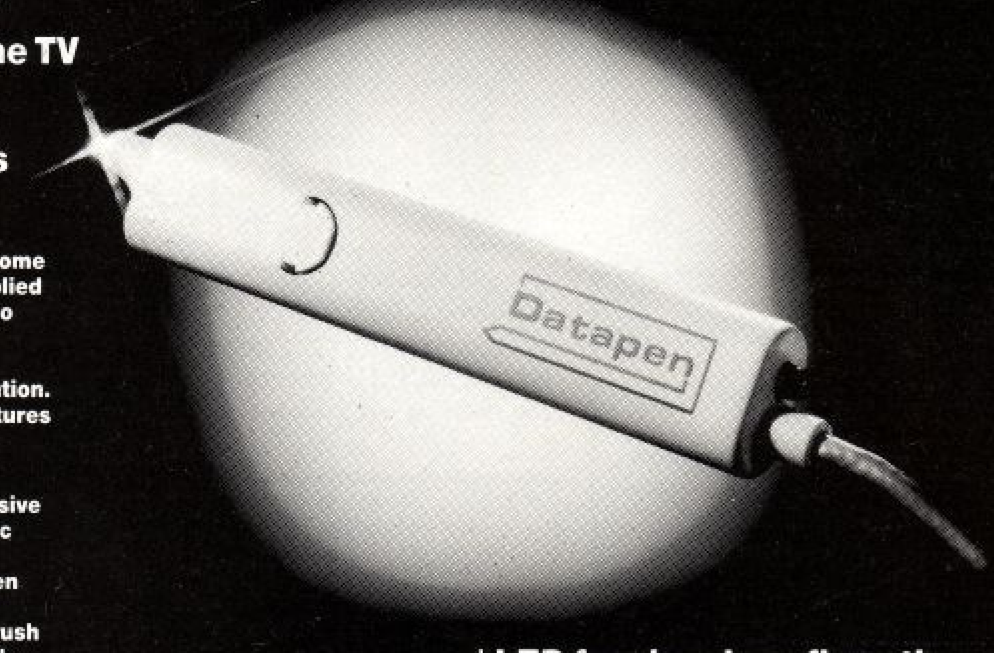
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The Least Significant Bit

Show offs

The Amstrad Computer User Show at the Novotel was, as those of you who fought through the crowds will confirm, an overwhelming success. This may not come as too much of a surprise to most of you reading this, since you are more than likely one of the more enthusiastic owners anyway, but there were certain Jonahs who regarded the event with suspicion.

The machinations concerning the original organisers did not help allay these fears, and so it was with considerable relief that we witnessed the queues building along outside the Novotel just before the opening.

At around 2.30 pm when these queues were heading into the distance, we began to panic that not everyone was going to get in before the show shut. Our apologies to those who had to wait 90 minutes to get in: next time there will be a great deal more confidence in the event and the extra space will ease the congestion.

The average age and general awareness of those attending confirmed what we at ACU had always suspected: Amstrad computer owners are serious enthusiasts and professionals into the second or subsequent systems, and it was a pleasure to be able to meet so many of you - even if you did all moan about the delay in subscription mailings.....

Going Soft

Hard hearted CP/M software publishers are missing a golden opportunity to breathe new life into their ranges of CPM 80 software that many had all but written off. DBase II at £395 is still a great program, but dBase II at £49.95 would be a show stopper. Maybe even at £99.95.

On the other hand, Sorcim's Supercalc2 at £49.95, Software Technology's Cracker at £49 and NewWord combined with the superb Spell Plus at £69.95 points the way, maybe they deserve to have their nerve rewarded by becoming the de-facto standards of the Amstrad marketplace.

The only bad news is that with such classic products at such low prices, hard working software houses who have followed and supported Amstrad from the games machine marketplace may find themselves simply overwhelmed by the products descending from the Big League. Let's hope that all can rise to the occasion.

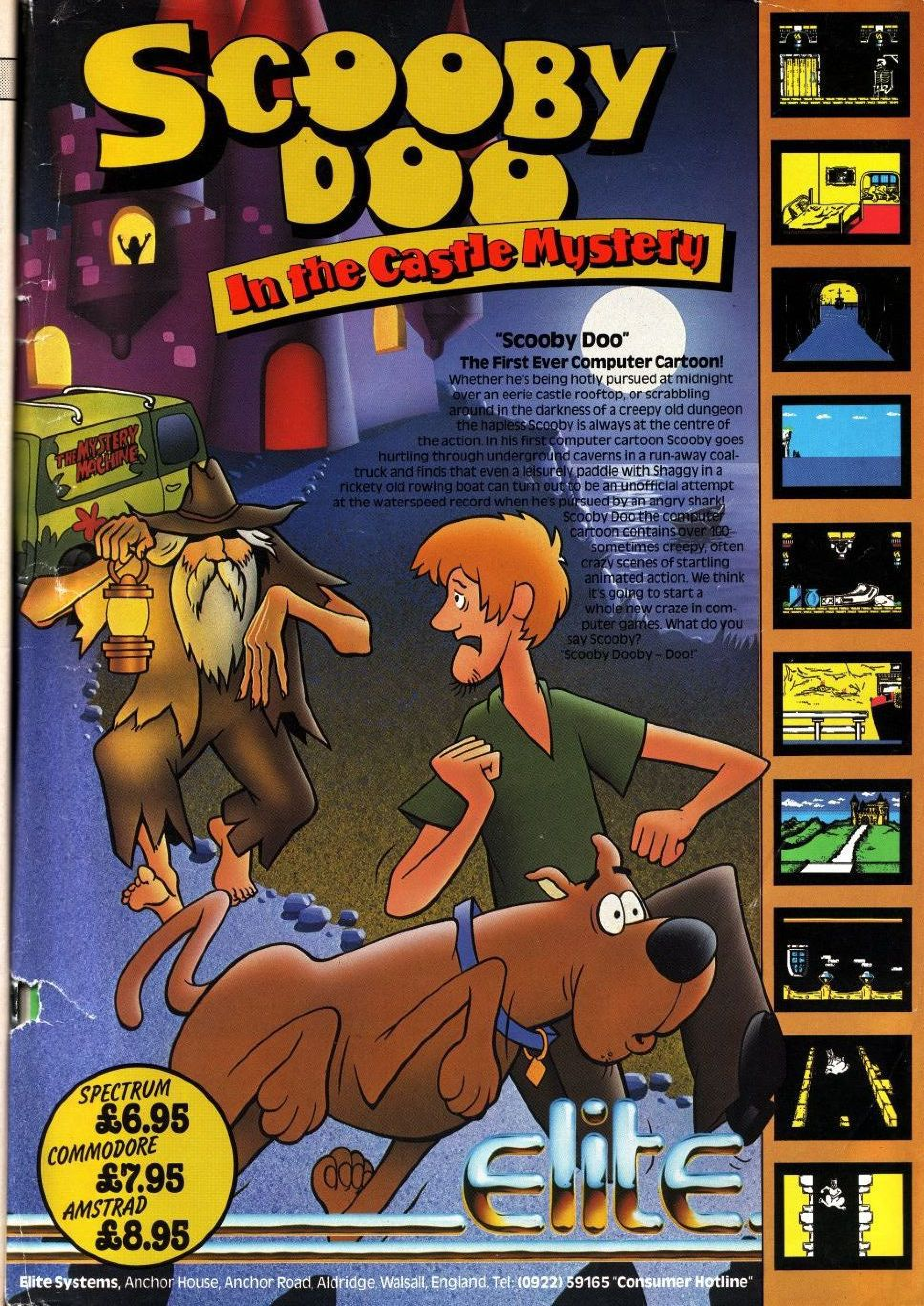
Goodbye/Hello

Editorial Assistant Anne Coker moves on to pastures new after this issue, and we wish her well. In her place we have stolen one of the famous Amsoft software development department - Alex Martin. Since Alex originally applied for a job with qualifications in industrial design, and just accidentally happened to be a competent BASIC and PASCAL programmer, maybe he will find a broader outlet for his many talents.

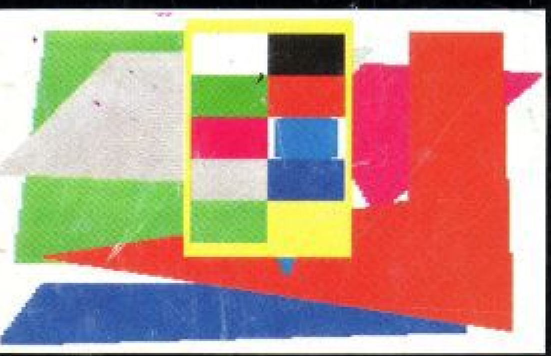
A question remains: just who is going to inherit his mug and set of crayons on Floor 6....?

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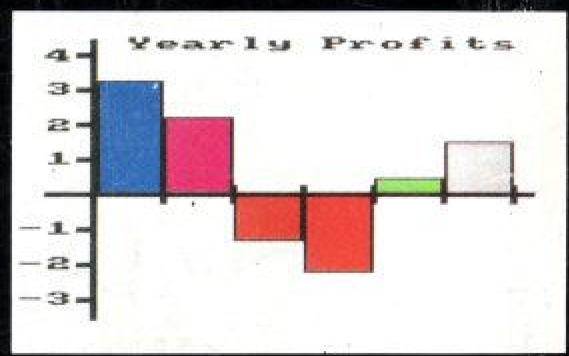




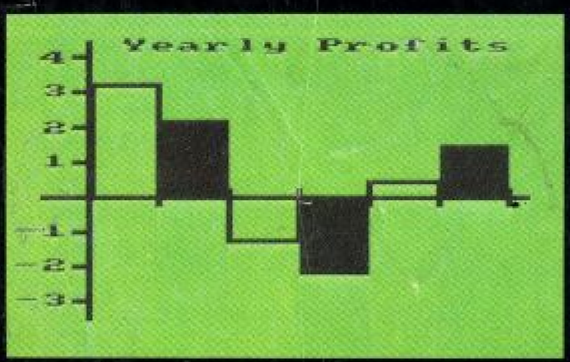
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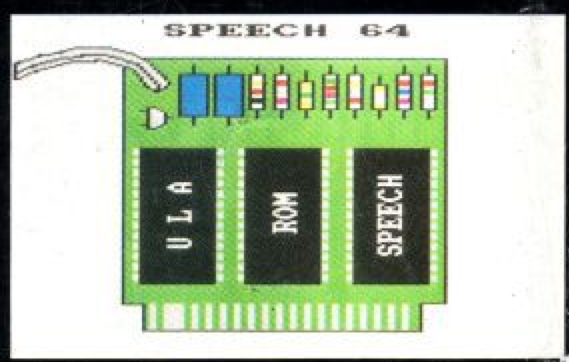
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